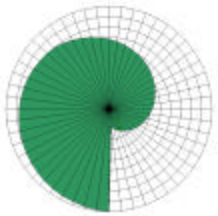

The Alberta GPI Blueprint

The Genuine Progress Indicator (GPI) Sustainable Well-Being Accounting System

by Mark Anielski

September 2001

Pembina Institute
for Appropriate Development

About the Pembina Institute

The Pembina Institute is an independent, citizen-based organization involved in environmental education, research, public policy development and corporate environmental management services. Its mandate is to research, develop, and promote policies and programs that lead to environmental protection, resource conservation, and environmentally sound and sustainable resource management. Incorporated in 1985, the Institute's main office is in Drayton Valley, Alberta with additional offices in Calgary and Ottawa, and research associates in Edmonton, Toronto, Saskatoon, Vancouver and other locations across Canada. The Institute's mission is to implement holistic and practical solutions for a sustainable world.

The Green Economics Program is dedicated to designing and implementing practical, street-smart economic tools that would reorient society back to the original meaning of the word "economy"—the care and management of the wealth of the household. By developing new tools for measuring the true wealth or well-being of nations, we can help guide Canadians and Albertans to a sustainable future.

For more information on the Pembina Institute's work, visit our website at **www.pembina.org**, or contact:

The Pembina Institute
Box 7558
Drayton Valley, Alberta T7A 1S7
tel: 780-542-6272 fax: 780-542-6464
e-mail: info@pembina.org

For more information on the Alberta GPI project, contact us at economics@pembina.org.

About this Report

This document represents a blueprint for measuring and managing for the sustainable well-being of nations. It is the architectural companion or "methodology primer" to the report *Alberta Sustainability Trends 2000: The Genuine Progress Indicators (GPI) Report 1961 to 1999* released April 23, 2001 (see www.pembina.org), which was the first application of the GPI sustainable well-being accounting methodology. This "blueprint" describes the rationale, structure and methods used in constructing a GPI System of Sustainable Well-being Accounts. By measuring the total and real wealth of nations, we are better equipped to ensure a sustainable future for future generations as well as our own.

The GPI accounting framework is an alternative to the current international System of National Accounts. Building on the traditional accounting language of "capital" and on accounting tools such as balance sheets, income statements and ledgers, the GPI accounting system offers a new tool for nations to measure, in an integrated manner, the condition, sustainability and monetary costs and benefits of human, social, natural and produced capital. The GPI accounting system was developed by considering some of the leading work for measuring economic, social and environmental progress in a holistic manner. Our hope is that researchers and policy analysts around the world will consider the merits of this new open architecture for measuring genuine well-being and the progress of nations, provinces, states and communities according to those parameters that make life worthwhile.

This work is dedicated to the spirit of those who gave us a new perspective on the real nature of economics and wealth including: Simon Küznets, John Cobb Jr., Herman Daly, Marilyn Waring, David C. Korten, Clifford Cobb, John Kenneth Galbraith and Armatya Sen. Without their vision and inspiration for an alternative and positive future, we would be without a compass to guide us to a new place.

 ISBN 0-921719-40-X

About the Author

The Pembina Institute assembled a team of analysts and economists to undertake the GPI project, but Mark Anielski, the project leader, wrote this GPI accounting methodology report.

Mark Anielski is Director of the Pembina Institute's Green Economics program. He also serves as Senior Fellow to the U.S. economic policy think-tank Redefining Progress in Oakland, California and he co-authored the 1999 U.S. GPI report. Mark currently advises Canada's National Round Table on the Environment and the Economy's Sustainable Development Indicator Steering Committee on the development of indicators for measuring sustainability in this country. As well, Mark teaches business and the environment in the University of Alberta's School of Business. He has considerable experience in public policy analysis including natural resource, energy, royalty and fiscal policy issues in both the public and private sectors. His expertise includes accounting for sustainable development, natural resource accounting, public policy analysis, business planning, and performance measurement. Mark pioneered the development of natural capital accounts for Alberta's timber, oil, gas, coal and other natural capital. He holds a Masters degree in forest economics, plus bachelor degrees in economics and forestry.

Acknowledgements and Disclaimer

The Alberta GPI Accounting project was made possible with the generous financial investment of Western Economic Diversification and, in particular Jason Brisbois and Brant Popp who had faith the potential of the Alberta GPI research initiative for accounting for sustainability and for serving as a powerful policy tool for charting a sustainable future for Alberta and Canada.

This ambitious project is a fulfillment of the dream of Mark Anielski who, while updating the U.S. Genuine Progress Indicator for Redefining Progress (San Francisco), envisioned a more expanded sustainable well-being accounting system that considered both the physical and economic dimensions of sustainable development. The author would like to particularly acknowledge the wisdom and guidance of John Cobb Jr., Herman Daly, and Clifford Cobb, the original GPI and Index for Sustainable Economic Welfare pioneers. I would also like to thank Hans Messinger (Statistics Canada), Ron Colman (GPI Atlantic) and Bill Rees (University of British Columbia) for their intellectual support and input. Finally the GPI accounts would not have become a reality without the extraordinary intellectual capital and dedication of the Pembina Institute's GPI team, including Mary Griffiths, Amy Taylor, Sara Wilson, Jeff Wilson, Barbara Campbell, Kim Sanderson and David Pollock.

Many people contributed their time, energy and intellectual capital to this important work including:

Vic Adamowicz, Glen Armstrong, Alan AtKisson (U.S.), John Barnard, Brian Bechtel, Roger Belland, Janine Benyus (U.S.), Elwil Beukes, Peter Boxall, Alice Born, Wegerif Boudewijn (Sweden), Gerri Brightwell, Anita Burke (U.S./Netherlands), Michael Cailey, Ted Chambers, Margaret Chandler, Ken Chapman, Archie Clark, Cliff Cobb (U.S.), John Cobb Jr. (U.S.), Ron Colman, Herman Daly (U.S.), John Dixon (U.S.), Richard Dixon, Steve Dobson, David Dodge, Larry Donovan, Len Douziech, Jim Edwards, John Elkington (U.K.), Salah El Serafy (U.S.), Peter Faid, Janet Fast, Phyllis Wooly-Fisher, Oliver Franke, Brian Free, Lee Funke, Raj Gill, Rich Goodkey, Bruce Halliday, Clive Hamilton (Australia), Kirk Hamilton (U.S.), Maureen Hart (U.S.), Jennifer Haslett, Mary Hirsch, Kelvin Hirsch, Gary Howe, Paul Hunt, Sharon Jamieson, Steve Janzen, Alison Jeffrey, Mark Johnston, Norah Keiting, Bill Moore-Kilgannon, David King,

Perry Kinkaide, Miles Kitagawa, Pat Klak, Joanne Kleijunas (U.S.), David C. Korten (U.S.), Ted Kouri, Harvey Krahn, John Kutyn (New Zealand), Howard Lawrence, Mai Anh Le Van, Peter Lee, David Link, Mark Lisac, Graham Lowe, Cheryl Mahaffy, Barry Marquardson, Sharon Mathias, Judith Maxwell, Janice McDougall, Stuart McFadyen, Cam McGregor, David McGuinty, Gary McPherson, Hans Messinger, Mark Messmer, Joseph Michalski, Bob Mitchell, Rick Moll, Andrea Moen, Steve Moran, Peter Morrison, Ryuji Mukae (Japan), Brian Nattrass, Ruben Nelson, Eric Neumayer (U.K.), Mike Nickerson, Mark Nicoll, Sandra Niessen, Andrew Nikiforuk, Richard Norgaard (U.S.), Tom Noseworthy, Tamara Nowakowsky, Barbara Nyland, Kirby O'Connor, Ken Ogata, Kathleen O'Hara, Doug Olsen, Lars Osberg, Charles Pascal, Richard Pauls, Roger Petry, Mark Polet, Paul Precht, Daryl Price, Duane Pyear, Ray Rasmussen, Doug Raynor, Bill Rees, Francis Remedios, Eric Rodenburg (U.S.), Michael Rowbotham (U.K.), June Ross, Jonathan Rowe (U.S.), Mark Rudolph, Mike Ryan, Zard Sarty, Roger Sauve, Karim Sayani, David Schindler, Juliet Schor (U.S.), Peter Sekulic, Laura Shanner, Andrew Sharpe, Susan Sharpe, Christopher Smith, Gary Smith, Grant Smith, Robert Smith, Roger Smith, Chelsea Somerville, Colin Soskolne, Kim Speers, Sherrelle Steele, Brad Stelfox, Harry Stelfox, Chuck Sterling, Brian Stocks, Thom Stubbs, Paul Swann (U.K.), Don Szarko, Richard Thomas, John Thompson, Kevin Timoney, Kim Travers, Annette Trimbee, Marvin Trimble, Adepeju Tunji (Nigeria), Dan Tunstall (U.S.), Allan Tupper, Wayne Tymchuk, Bill Van Iterson, Casey van Kooten, David Van Seters, Werner von Bischoffshausen (Chile), Mathis Wackernagel (U.S.), Mark Wade (U.K.), Marilyn Waring (New Zealand), Allan Warrack, Cal Werner, Bill White, Malcolm Wilson, Gary Wolff (U.S.), Gary Woloshyniuk, Armine Yalnizyan, and Sandra Zagon.

The contents of this report are the responsibility of the Pembina Institute and do not necessarily reflect the views and opinions of those who are acknowledged above or the opinions or positions of Western Economic Diversification.

We have made every effort to ensure the accuracy of the information contained in this document at the time of writing. However, the author advises he cannot guarantee that the information provided is complete or accurate and that any person relying on this publication does so at their own risk. Given the broad scope of the project and time constraints, it has not been possible to submit the entire report for peer review. The material should thus be viewed as preliminary and we welcome suggestions for improvements that can be incorporated in any later edition of the work.

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Figures and Tables

Preface

For more than 50 years, nations have measured and compared their economic well-being according to the Gross Domestic (or National) Product—the total amount of cash flowing in an economy. The more GDP rises, the better the overall welfare of the nation or community is assumed to be. A rising GDP tide is assumed to automatically raise the fortunes of all ships (households) in society. But is continuous GDP growth sustainable if the very conditions of living capital on which current and future societal well-being depends, are being eroded? How do we know whether societies are on a sustainable path if we measure well-being through the narrow lens of the GDP?

Our vision for the 21st century is that societies begin to reorient their human capacity for stewardship away from the focus money that so dominates our world and toward genuine stewardship and nurturing of the conditions of living capital that make life worthwhile. We recognize that measuring that which makes life worthwhile is a daunting exercise. Wisdom counsels that money is not everything but common sense also advises that measuring everything that makes life worthwhile may be impossible and impractical. Nevertheless, even an initial small step toward measuring the physical conditions of living is better than the coarse measure of the GDP and other money metrics.

The development of the Genuine Progress Indicators (GPI) Sustainable Well-being Accounting System is a component of our vision at the Pembina Institute to introduce practical tools for managing for a genuinely sustainable future. If we can begin to measure living capital in a holistic framework, beyond simply money expressions of wealth, we will be more knowledgeable, wiser and more effective stewards of our households, communities and the natural world.

Our work is dedicated to the early pioneers and prophets who, for years, have found themselves in the wilderness. These include John Cobb Jr., Herman Daly, and Clifford Cobb who brought us a new "theology" and fresh ideas for moving toward a sustainable future in their seminal work *For the Common Good*. Their Index for Sustainable Economic Welfare (ISEW) was the genesis of work by San Francisco-based Redefining Progress, which led to the development of the U.S. GPI in 1995. The ISEW and the GPI frameworks of measuring well-being, beyond simply adding up monetary transactions, showed what was possible and that an alternative to the GDP might well be available.

The Alberta GPI accounting work represents a new chapter in this journey toward alternative ways of measuring genuine well-being and sustainability. We join with a growing number of economists, citizens, politicians, social justice advocates, religious leaders, students, farmers and many others who question our model of eternal economic growth. We have begun to ask serious questions about globalization, corporate governance and liberalized trade. "For whom and for what, more growth?" as Simon Küznets challenged, is the question. Some answers are provided by holding up the "mirror" of the GPI accounts.

The Genuine Progress Indicators System of Sustainable Well-being Accounts is a step along a new path that begins to align our accounting systems and measures of progress with what we intuitively understand contributes to our well-being. GPI Accounting leads us back to accounting for real economics, which is, by definition *the care, stewardship* or *management of the household*, and real wealth—*the condition of well-being*. While measuring such conditions of well-being are challenging and fraught with value judgments, any movement toward a more honest and holistic portrait of the real wealth and conditions of nations is welcome. But we are one step closer to accounting for the physical realities of those things that make life worthwhile beyond money. We are thus better informed and equipped to be effective stewards of all wealth towards a truly sustainable future.

Mark Anielski
Director, Green Economics Program,
Pembina Institute for Appropriate Development (Edmonton, Alberta)

1.0 Introduction

For more than 50 years economists have measured the economic well-being of nations using a System of National Accounts (SNA) and a broad measure called the Gross Domestic Product (GDP). However, the SNA and GDP measure well-being through a very myopic lens: the more money that changes hands for goods and services produced and sold in the market, the more it is assumed our economic well-being improves. This narrow measurement system is fundamentally flawed. First, it does not accord with the letter and meaning of the words "economic" and "wealth" and, second, it fails to measure the real conditions that common sense tells us contribute to our genuine well-being—our physical, mental and spiritual health; the social cohesion of our households and communities; and the integrity of the natural environment.

Measuring the health of a nation using a measure such as the GDP is like a doctor using the blood pressure reading of a patient as the primary indicator of good health. In the language of economics, an increase in GDP (that is, more money changing hands) is automatically assumed to be good for everyone. But is it?

How should we measure the genuine well-being of our communities and nations if not according to the monetary expressions of what we produce and consume? This is the fundamental challenge addressed in our attempt to construct an alternative accounting system—the Genuine Progress Indicator System of Sustainable Well-being Accounts—that begins to measure the genuine physical conditions of life.

1.1 What's wrong with the GDP?

The problem with the GDP and money-based measures of progress is that they fail to measure those things that really matter in our lives. According to the GDP, the more we spend, consume and produce the more the GDP rises. Such a meter of economic progress is flawed because it makes no distinction between production that genuinely improves well-being and activities that degrade our personal, community and environmental conditions.

The basic flaw with the GDP and money-based measures of progress is that they fail to measure those things that really matter in our lives.

Robert Kennedy identified the basic flaws in the GDP and the SNA when he noted: "it [the GDP] measures everything except that which makes life worthwhile"[1]—like the quality of our time spent at work, play and volunteering, or the health of our bodies and the environment. Kennedy was really calling for a new system of accounting for well-being that accorded with the physical realities of our lives.

So why, after more than 50 years of the GDP, do we continue to use an outdated and counter-intuitive accounting system that seems only able to add and not subtract? How can we better measure genuine well-being and the real things that make life worthwhile?

Simon Küznets, winner of the 1971 Nobel prize in economics and one of the early pioneers of the SNA and the GDP in the U.S. in the 1940s warned the U.S. Congress: "The welfare of a nation can scarcely be inferred from a measurement of national income as defined (by the GDP) ….Goals for more growth should specify of what and for what."[2] He recommended (1965) going beyond the GDP by constructing a single "yardstick" that would more holistically account for the economic and social dimensions that currently do not enter the GDP figures and national accounts.[3]

Amartya Sen (1999), former senior economist with the World Bank and 1998 Nobel Prize winner in economic science, calls for a new economic model to guide global development—one that relies less on traditional economic measures of prosperity such as income and the GDP and more on new measures of freedom, "functioning" and human "capability."

And economist John Kenneth Galbraith (1999) has observed that the most important "*unfinished business*" issues for economics include: the shortcomings of GNP/GDP as an economic measure; economic instability (cycles of boom and bust); and poverty and income inequality.[4] Galbraith remarked, "There is a major flaw in measuring the quality and achievement of life by the total of economic production—GNP/GDP—the total of everything we produce and everything we do for money." He echoes the words of Simon Küznets, noting that measures such as GNP override and obscure deeper and more important aspects of economic life, failing to "take sufficient account of the value and enjoyment of what is produced."

Most recently, Canada's Finance Minister Paul Martin has called for "new ideas and test[ing] of old assumptions" about how to measure economic progress (i.e., beyond GDP) that would encompass a wider range of environmental and sustainable development indicators, as well as social and human health indicators.[5]

1.2 The Genesis of Genuine Progress Indicators

A new movement is taking shape in Canada and in other countries to finally address the longstanding challenges posed by Simon Küznets. Our efforts in developing the Genuine Progress Indicator (GPI) accounting system recognize the important contribution that SNA and GDP accounting have made toward measuring economic progress since World War II. However, we believe a new 21st Century accounting system is needed—one that moves beyond money expressions of wealth and closer to measuring those things that make life worthwhile.

The Alberta GPI Accounts project is a first step towards such a holistic and integrated system for measuring well-being and sustainability. The project has two major parts: 1) a conceptual "blueprint" for measuring sustainability and well-being, and 2) a set of accounts that reveals the physical and monetary values of human, social, natural, and produced capital or wealth. This requires a comprehensive set of "books" or accounts to track genuine well-being and sustainable progress. The GPI Accounts give citizens a "big picture" perspective on the genuine state of their well-being, in accordance with their values and life experiences. Our vision is that the GPI accounting system will be a first step towards the vision and dream of Küznets: a comprehensive, practical and policy-relevant accounting system for measuring total well-being according to the physical realities of living.

1.3 Redefining Economics and Progress

Revisiting the origins of the words "economic" and "wealth" are fundamental to the GPI project. The word "economy" comes from the Greek *oikonomia* meaning "the management of the household" (*oikos*). Economics should thus be concerned with the quality of the lives of families and households. Aristotle made a clear distinction between *oikonomia* and *chrematistics*—the science of the wealth of nations, as expressed in terms of money.[6] The word "wealth" comes from the Old-English "weal," meaning "the condition of well-being."

In principle, economists should be concerned with measuring the conditions of the well-being of the households of a community or nation as well as the conditions of the natural environment that contribute to human well-being. It may be that modern-day economics is out of touch with the physical conditions of well-being and too focused on money values.

The GPI accounting model also provides a means of truly accounting for sustainable development by explicitly measuring the physical conditions of all living and produced capital. GPI accounts paint an important portrait of these conditions, both past and present, and thus are useful for asking, "what are the well-being prospects of our children and grandchildren?"

2.0 What is GPI Accounting?

The Genuine Progress Indicators System of Sustainable Well-being Accounting is a new blueprint for measuring and managing the total wealth of communities and nations. It was applied for the first time to the province of Alberta, Canada in the report *Sustainability Trends 2000*.

GPI accounting yields a comprehensive assessment of the total well-being of a society, its economy, and the natural environment. It considers the physical conditions of well-being that contribute to a high quality of life and a sustainable lifestyle. Raw time-series data from government, statistical agencies and other reputable sources are used to construct the accounts. These include conditions of personal health, social cohesion, intellectual capital, economic prosperity, and the sustainability of natural capital and the health of the environment.

GPI accounts are developed along the lines of traditional accounting standards and represent a synthesis of many existing measurement systems. Their innovation stems from providing a more holistic and integrated accounting of the physical, qualitative and monetary dimensions of all living and produced capital.[*]

In addition to the report Sustainability Trends 2000, a series of background reports is also being published as part of the Alberta GPI project. These 28 documents will be available on the Pembina Institute's web site as they are released in late 2001. See Appendix A for a complete list.

[*] "Living" capital refers to people, society, and nature. "Produced" (or "manufactured") capital refers to financial wealth and infrastructure.

3.0 Alternative Frameworks for Measuring Well-being

Various alternative systems have been developed for measuring well-being, many of which were reviewed thoroughly in developing the approach for Alberta. This chapter briefly describes the main frameworks that have been documented and applied over the last 60 years; more details are available in Appendix B.

3.1 In the beginning, were the SNA and GDP...

The SNA and the GDP originated in the early days of World War II. In 1939, as a basis for helping Britain finance the war, John Maynard Keynes and Richard Stone began developing a national accounting system to measure activity in the British economy. About the same time, U.S. statistician and economist Simon Küznets began a parallel development of the U.S. System of National Accounts (SNA). Küznets became one of the principal architects of the U.S. and United Nations SNA, which are used by virtually every nation to measure economic activity and well-being. The GDP (or GNP, Gross National Product) arises from the SNA; it is used to compare the economic performance of nations and is the basis for the monetary policies of the World Bank and the International Monetary Fund.

Measuring the total economic activity of nations (expressed in terms of money) is useful for tracking goods and services trading in an economy and between nations or communities. But the SNA and GNP/GDP were never meant as holistic measuring instruments for tracking the physical conditions of the well-being of nations.

Pursuit of goals for more GDP growth, more trade, competitive advantage and more monetary wealth is fundamentally at odds with the notion of sustaining or improving the conditions of living capital.

In the 1960s, social indicators began to emerge to measure quality of life. In the 1970s, concerns about environmental degradation led to the establishment of environment ministries, environmental research, and environmental indicators and reporting. Then in 1987, the Brundtland Commission popularized the term *sustainable development*: "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs."

Sustainable development was a call for a more holistic and integrated approach to measuring and managing economic, social and environmental factors in decision-making processes. However, these two words have probably created more confusion than clear answers to how to manage now and for the sustained well-being of future generations. Part of the reason, we suggest, is that "economic growth" remains the dominant voice. Pursuit of goals for more GDP growth, more trade, competitive advantage and more monetary wealth is fundamentally at odds with the notion of sustaining or improving the conditions of living capital. In a world focused on the pursuit of monetary objectives and on measuring prosperity, is it any wonder that the words "sustainable" and "development" are problematic?

After more than 13 years of debate about how to live with "sustainable development," we still lack a conceptual and pragmatic analytical framework for managing living and produced capital with a view to its physical conditions. This is partly because we are fixated on monetary expressions of what we falsely call "wealth." We need a new accounting framework for managing the real physical or qualitative conditions of wealth in its original context—the conditions of well-being. Such an accounting system must be fundamentally rooted in

experiential science and the physical, oral and spiritual knowledge of those things that contribute to genuine well-being and genuine qualitative "development."

This is no easy task given the inertia of a money-based accounting system. Any system that attempts to holistically measure the physical realities of life is bound to be complex and messy since there are no common "measuring sticks" (like money) to compare one form of living capital with another. Certainly, Küznets and Keynes must have understood the difficulty of establishing a system of accounts for measuring the true well-being of human, social, natural, produced and financial capital. It was far easier to track the money changing hands in a marketplace than to measure the genuine conditions of living.

But with the advancement of computers and a plethora of data, it is now possible to begin designing a holistic accounting system to integrate the complex factors that we know contribute to overall societal and environmental well-being. To do this right means integrating data and value systems across many disciplines and is a daunting and humbling task.

3.2 Pioneers in Well-being Measurement

Our GPI accounting project built on the results of previous pioneering efforts to measure quality of life and sustainable development. According to the economic policy think-tank Redefining Progress in San Francisco, there are now over 300 initiatives in North America involving indicators of quality of life, economic well-being, sustainable development, and government performance at the national, regional and community level.

We observed that what has been lacking to date, is a pragmatic framework that unifies and synthesizes many perspectives into a holistic, systems-based accounting framework for measuring total well-being. The GPI accounting system attempts to present such a framework within which many lay and professional perspectives on quality of life and well-being can be examined and assessed—from a physical, societal or environmental well-being perspective as well as from a financial or economic perspective. The GPI framework presented in our work was an effort to take the best of many existing frameworks while relying on existing data to construct the accounts.

In developing the GPI accounting system, we considered a number of exemplary measurement and indicator frameworks listed below. Our inventory is by no means exhaustive. What we sought was an organic process by which improvements could be made over time to the GPI framework through application, experimentation and further research. Our goal is to improve the elegance and practicality of the GPI accounting tool.

The **Alberta Government's *Measuring Up*** government performance measurement system tracks 24 or more key performance indicators clustered according to three themes of people (human health), prosperity (economic) and preservation (environment, social) to measure the outcomes against predefined performance targets. Many of the indicators used in the Alberta GPI Accounting framework were drawn from the *Measuring Up* report as well as from other Alberta Government ministry measures, although attempts were made to create longitudinal data sets that extended back to 1961. While the Government's choice of indicators may align with political mandates and ideologies, they do not necessarily encompass all the measures that citizens in a pluralistic society might consider important for defining well-being. A key issue in constructing a set of indicators of well-being is to engage citizens in a dialogue about what they consider important to their well-being and quality of life and then establish and align indicators with these values.

The **U.S. Genuine Progress Indicator** and the **Index of Sustainable Economic Welfare (ISEW)**[7] were used to construct the Alberta GPI Income statement. This allowed us to derive a net sustainable income line for assessing the full costs and benefits associated with the use of human, social, produced and environmental capital. The ISEW first appeared in the book *For the Common Good* (1989*)* by Herman Daly and John Cobb Jr. and was developed by Clifford Cobb. The ISEW is an attempt to derive a sustainable economic welfare measure by:

- starting with the GDP (gross income or expenditures),
- then adjusting for unaccounted benefits (such as unpaid work including housework, parenting, volunteerism; the value of services from household and public infrastructure, and; the value of spending on health and education), and
- deducting various regrettable costs or depreciation costs including social costs (such as the cost of crime and income inequality) and environmental costs (such as nonrenewable energy depletion, environmental degradation, air quality and water quality degradation, agriculture losses, loss of wetlands and old growth forest losses).

The U.S. GPI was developed by Clifford Cobb for Redefining Progress. It was released in 1995 as a modification of the original ISEW framework. The U.S. GPI has been updated three times since 1995, the most recent being December 2000 (see www.rprogress.org). The ISEW and GPI frameworks have been replicated by researchers in several countries including Canada (Messinger and Tarofsky 1997) and Australia (Hamilton 2000).

The **Australian GPI** (Hamilton 2000) is a slightly modified and improved methodological version of the original U.S. GPI, the methodology of which has not been modified since 1995. It adopts some new valuation methods and includes estimates of the value of education, health spending and the cost of gambling and advertising. Many of the full cost-benefit valuation methods used in the U.S. and Australian work were adopted and modified for the Alberta GPI Income Statement to derive a made-in-Alberta GPI bottom line.

The **Nova Scotia GPI** initiative (Colman et. al. of GPI Atlantic) involves the construction of roughly 20 individual genuine progress indicators to account for sustainable development in Nova Scotia. The 20 GPI accounts cover aspects of economic, social and environmental well-being. The GPI Atlantic initiative avoids indexing or aggregation of measures into a single composite index or monetary bottom line (like the U.S. and Australian GPI). However, the basic approach to measuring, in part, mimics the original U.S. GPI model whereby attempts are made to impute the full monetary benefits and costs associated with human, social and natural capital that currently contributes to (or is left out of) the GDP figures. Components that are unique to the Nova Scotia GPI include time-use accounts, ecological footprint analysis and transportation accounts. The GPI Atlantic research and development of GPI accounts is vital for advancing sound and rigorous methods that can be replicated elsewhere. Colman's work is inspirational and vast in its scope. He takes a collaborative approach, engaging many experts, researchers, national statistical agencies and other agents in constructing the accounts. Some of the methods used to develop the Alberta GPI accounts were inspired by the work of Colman and his team.

The **Dashboard of Sustainability,** developed by the International Institute for Sustainable Development (IISD), is a set of aggregates of various indicators. Each of the three broad clusters—economic, environmental and social—is represented as values or indices, or dials on a "dashboard." The concept of a dashboard of instruments for presenting sustainability indicators helped to inspire the Alberta GPI framework and the GPI Sustainability Circles.

The **Human Development Index (HDI)** developed by the United Nations Development Programme, is an aggregate index of human well-being using three primary measures, all with equal weighting. These include standard of living (measured by GDP per capita and income above the poverty line), educational attainment (measured by adult literacy and years of schooling), and longevity (life expectancy). The methods used for indexing and aggregating variables with different reporting standards were used, in part, as the basis for indexing Alberta's GPI Account variables for the construction of longitudinal trend indicators and in creating aggregate GPI Sustainability Circles and composite indices. The HDI is an important benchmark for measuring quality of life since it provides a method for combining otherwise incomparable variables of physical and economic well-being. Its key limitation is that it only comprises three variables in defining human well-being. The Alberta GPI expanded the UN HDI accounting system to some 51 variables of human, social, and environmental well-being.

The **Index of Social Health (ISH**), developed by Marc Mirginoff of Fordham University, is a composite index of 17 socio-economic indicators. Similar to the UN HDI, it indexes raw data and then aggregates indicators to create a composite index. Indexing involves establishing benchmarks of performance that are deemed optimal or ideal conditions of human and social well-being, then converting the raw data set to an index using a scoring system from 1 to 10. A similar approach was used in constructing the Alberta GPI composite indices for economic, social and environmental well-being. Human Resources Development Canada (1996) has also experimented with the ISH, using it to estimate provincial ISHs and a national average. The ISH framework also helped shape the **Edmonton Social Health Index** developed by Mark Anielski for the Edmonton Social Planning Council.

As well, we acknowledge the important work of Lars Osberg and Andrew Sharpe (Centre for the Study of Living Standards) in developing the **Index of Economic Well-Being (IEWB**) for Canada, the U.S. and other OECD nations. The IEWB combines the strengths of aggregation of indicators, like the ISH, as well as drawing heavily on traditional economic variables.

The **Calvert-Henderson Quality of Life Indicators**[8] were developed for the U.S. by economist Hazel Henderson and the Calvert Group (a U.S. asset management firm specializing in social responsibility investing). This represented the first national, comprehensive assessment of the quality of life indicators in the United States taking a systems approach. The Calvert-Henderson model, which uses a "pie" analogy to show the composite of quality of life indicators inspired construction of the Alberta GPI Sustainability Circles.

Statistics Canada's System of Environmental and Resource Accounts is a system of natural capital and environmental stock, flow and monetary accounts for natural capital and environmental assets. It was the basis for developing the Alberta GPI Accounts for non-renewable energy, forests, agriculture, fish and wildlife, air (including greenhouse gas emissions), water, parks and wilderness, toxic and landfill waste, wetlands and peatlands, carbon, and ecosystem health accounts. Original work by Anielski (1997, 1996, 1994, 1992[a-d]) to construct resource accounts for forests, oil and gas, and carbon for Alberta was also used. In addition, the **World Bank's Total Wealth of Nations (*Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development, 1997*)**—an attempt to construct monetary measures of produced, natural and human capital—provided a basis for constructing a total wealth accounting framework for the Alberta GPI Accounts.

The **Ecological Footprint (EF),** developed by Mathis Wackernagel and Bill Rees (1996), is an accounting tool that calculates the productive land area required to sustain or meet the needs of current levels of consumption and assimilate the waste generated by households. Based on

converting household personal consumption expenditures to resource and land-use consumption equivalent (expressed in terms of land area required to meet consumption demands), the EF is an important aggregate indicator of the effects of economic decisions on the environment. EF analysis can be compared to the natural carrying capacity (based on arable land available) of the country or region of analysis. Thus it is possible to assess, in a meaningful way, whether a populace is living beyond or within the carrying capacity of the land they occupy, or whether they are living off the natural capital of other nations or regions. EF is a powerful tool for assessing the sustainability and self-reliance of a community. It can also be used to assess material and energy flows in a trade model that considers physical realities of these flows as well as the monetary expressions of traded imports and exports. EF estimates for 52 countries (80 percent of the world's population) have been calculated by Wackernagel[9] (http://www.rprogress.org/resources/nip/ef/ef_nations.html). An EF has been estimated in the Alberta GPI Accounts based on the original Wackernagel/Rees model.

The **U.S. Sustainable Development Indicator (SDI) Working Group's** (formally the Inter-Agency Working Group on Sustainable Development Indicators, reporting to the President's Council on Sustainable Development) developed a framework (http://www.sdi/gov/) that groups indicators in three categories:

1) endowments (capital or wealth, and liabilities);
2) driving forces and processes (savings/investment or dis-savings/depreciation); and
3) current outputs and results (goods and services used, value derived by satisfying wants and needs).

This model is consistent with the Alberta GPI Balance Sheet framework showing "endowments" as the stocks, capacities or condition of assets that current and future generations can draw upon to meet their needs and wants as well as liabilities, capacities, or conditions that may impose risk or costs to the welfare of future generations. Many of the U.S. SDI output and results indicators are consistent with the Alberta GPI indicators. The U.S. SDI "driving forces" are identified as directly causing increases or decreases in endowments.

Other models for frameworks worthy of mention include:

The **Genuine Savings Indicator** (attributed to Pearce 1999), which calculated economic well-being by deducting consumption from the GNP/GDP (gross savings), deducting depreciation on produced assets (net savings), the net of depreciation of living capital resources, depletion of mineral resources and pollution costs and adding expenditures on education, as a measure of investment in human capital.

The **Barometer of Sustainability** (Prescott-Allen, in press), which is an instrument for assessing a region's progress toward sustainability objectives (defined by citizens) through the integration of economic, biophysical and social health indicators.

The **Global Reporting Initiative (GRI),** which was established in 1997 as a corporate/NGO/government/accounting organization initiative to design global accounting guidelines for sustainability reporting. It was aimed primarily at business but is applicable to other organizations. The GRI guidelines provide a standardized sustainability reporting framework that stresses the linkages among economic financial, environmental and social performance. Combining the strengths of the GRI sustainability reporting framework with the macro sustainability reporting framework of the GPI Accounting system merits consideration.

4.0 The Alberta GPI Accounts Blueprint

The Alberta GPI accounts contain 51 ledgers, or sub-accounts, for economic, social and environmental well-being, drawing from existing data sources over four decades (1961-1999). These accounts allow citizens and decision makers to examine the long-term trends, compare trends and see a "landscape" portrait of how society has changed in terms of the condition of the environment, people, households, communities, business, and government. The information can be used to generate "State of Well-being" annual reports to citizens, as shareholders in the total wealth, or conditions of well-being.

The total capital accounting framework in the GPI accounts is centered on the three themes of economy, society and environment, and uses traditional financial accounting structures, including:

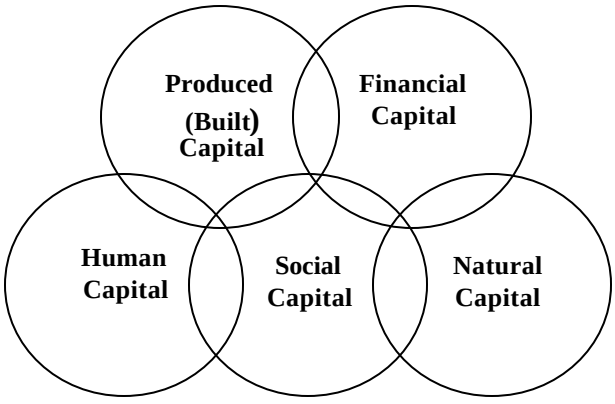
- Ledgers (accounts);
- Balance sheet (assets, liabilities, distribution of wealth), and;
- "Net sustainable" income statement (GDP adjusted for human, social and environmental benefits and costs).

4.1 Living and Total Capital Accounting

The GPI Accounts track the physical, qualitative and monetary conditions of five forms of capital: human, social, natural, produced and financial (see Figure 1). Human, social and natural are collectively defined as *living capital.* Spiritual capital is another form of human capital, but is not explicitly counted in the GPI work.

Figure 1: Human, Social, Natural, Produced and Financial Capital

The Five Rings of CAPITAL
for Measuring Well-being



4.1.1 Wealth

Wealth is defined as the "condition of well-being" associated with human, social, natural, produced and financial capital. The current GPI accounting structure assumes that all capital is equal. Of course this is debatable and requires a thoughtful discussion of the importance of one condition of well-being relative to another. Nevertheless, the GPI accounts acknowledge the interconnected nature of the conditions of well-being and that the well-being of the whole is the sum total of its parts. The evidence of substitutability and complementarity within and between classes of wealth can be revealed in the GPI accounts. For example, the GPI accounts can compare trends in economic growth (GDP) with the conditions of human health, social cohesion and the environment. The cost of continued economic growth might be seen, for example, in declining environmental quality and natural resource stocks. Such analysis allows us to assess the impacts of pursuing one form of wealth management over another.

> Wealth is the "condition of well-being" associated with human, social, natural, produced and financial capital.

4.1.2 Human capital

Economics traditionally defines human capital in terms of:

- Health and wellness (life expectancy, disease, mental health, accidents, poverty);
- Intellectual capital (education, knowledge and skills of individuals, household and communities); and
- Time-use (paid and unpaid time use) and productivity (the utility of hours spent at labour).

Labour includes time devoted to paid work and time spent in non-market activities (housework, parenting, eldercare, volunteerism and leisure). Traditionally, economics has focused on measuring paid labour productivity (the amount of output per unit of labour input) or the efficiency of labour as an indicator of healthy economies. But human capital is more than this. Human capital should include measures of physical, mental and spiritual well-being of individuals, households and communities, using objective and subjective measures.

From the perspective of households, human capital should include an account of non-market, unpaid time use by individuals and households (the allocation of a 24-hour period to paid work, housework, parenting, eldercare, volunteerism, leisure and sleep). In addition, human capital includes the health and wellness of individual members of a household and the well-being of the household as a unit; this notion might extend to the well-being of the community of households. The premise is that a healthy, more educated and skilled labour force will lead to a healthy economy defined as the productive and efficient use of other forms of capital. Human capital, like produced and natural capital, can deteriorate without stewardship or management of human health and intellectual capital of individuals in society and the economy. The GPI accounts consider the condition and monetary values of intellectual capital, health and wellness, and time use.

4.1.3 Spiritual capital

While not explicitly counted, another form of human capital is "spiritual well-being." But how can we measure the health of the soul along with the health of the body, mind and spirit of individuals? Intuitively, spiritual well-being is as important in defining individual and collective well-being as are bodily health and material needs. Spiritual capital is rarely

mentioned or explicitly measured in discussions of the wealth of nations. Perhaps it should remain unmeasured and subjective, but consultation with some religious leaders and theologians in developing the GPI accounting framework for Alberta suggests that at the very least, spiritual well-being should be considered in future accounts.

4.1.4 Social capital

Social capital is broadly defined in terms of the wealth or well-being of the community as a whole. This includes the cohesion and interrelationships of members of a community, both at the family and community level. There are many different approaches to measuring the social health of a community, which could include measures of the health of democracy, political systems, justice, and legal and commercial institutions. Social health can also be assessed in terms of demographics, health and wellness (public health), abuse (physical, mental, sexual), public safety (crime and violence), distribution of income and wealth, poverty, democratic participation, social services, education services, public infrastructure, indigenous community well-being, and archaeological and historical resources.

4.1.5 Produced capital

Produced or built capital includes the stocks of physical equipment, machinery, buildings, and infrastructure that provide service to households and the community that contribute to economic well-being. Most produced capital results from the inputs of natural capital and human capital. The benefits from produced capital included a stream of services that can be measured in monetary terms (e.g., depreciation), in physical terms (e.g., useful energy, the utility of streets, water, power, and sewage systems), and in terms of the value derived from household infrastructure (the home and appliances), automobiles, factories, equipment, public transit, hospitals, or roads and highways. Produced capital is often defined as "durables" in the national income accounts and applies to households, business and government. Historically, public assets and infrastructure have not been accounted for in terms of utility or depreciation costs.[10] To a lesser extent this is also true of household infrastructure. Economists assume that the greater the size of the existing produced capital, the better off society is. However, these assets break down, deteriorate and depreciate physically and in terms of the sustained monetary value of their services. Prudent accounting would begin to measure both the physical condition and expected life of all produced capital and to assign a portion of the depreciation cost against the gross income (i.e., GDP) of a nation or community. This estimated value could then be used as the basis for budgeting to sustain, replace or improve the productive utility of produced capital.

4.1.6 Financial capital

Financial or credit capital (financial wealth) is the form of money or monetary equivalents. This includes fiat currency,[†] debt-based money instruments (loans, mortgages, bonds), financial savings and investments by households, business and government. All financial capital is created through human institutions (banks, governments) as a medium of exchange between other forms of capital. As such, modern money and money creation (primarily in the form of debt) have little or no relationship with living capital. This presents a controversial conundrum at the very centre of accounting for genuine well-being. If money is an artificial creation and is not explicitly linked to real wealth, then how should we "value" things if not in terms of money? This process of making more money may in fact be eroding the integrity

[†] "Fiat" is from Latin, "let it be done." Fiat currency is paper money that has been authorized as legal tender by government decree, but cannot be exchanged for its value in ordinary coin.

of human, social and natural capital upon which genuine economic well-being depends. Traditional stewardship of financial capital involves investing a portion of financial income gained from other forms of capital into a financial stock that will yield a future monetary stream of benefits. Moreover, the process of debt repayment by households, government and business effectively constrains their capacity to pursue genuine well-being objectives. The same can be said for household, farm, student and business debts. However, genuine well-being ultimately depends on sustaining or improving the conditions of living capital. A debt-based money system committed to making money from money and repaying debts, which were fiat from the start, presents a unique accounting challenge. How should we reconcile physical accounting of living capital with accounts of financial assets?

4.1.7 Natural capital

Natural, or "environmental," capital refers to:

a) Natural resources (both renewable and non-renewable);
b) Land; and
c) Ecosystems (environmental systems services).

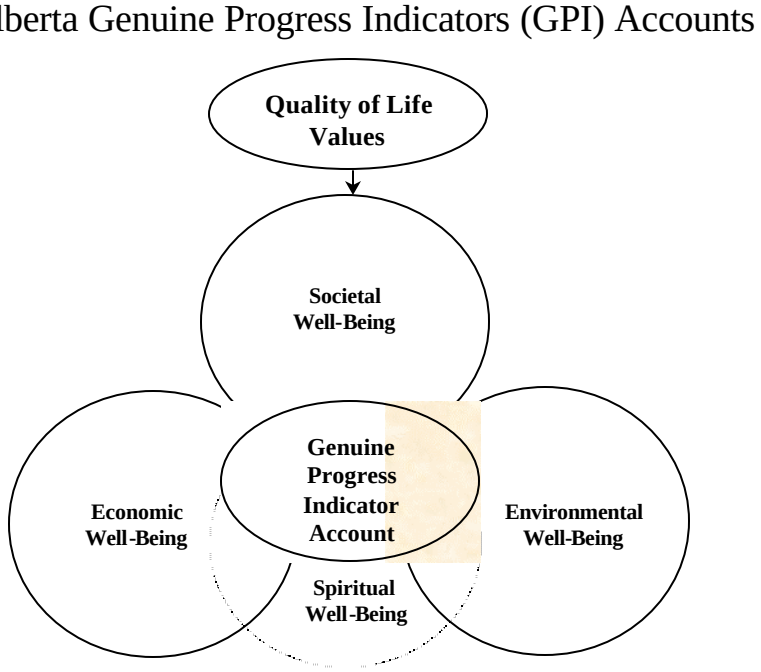
Natural resources are the basis of the production of manufactured goods while ecosystems provide essential services such as cleaning the air and providing clean water. Ecosystem services also include the provision of productive soil, biodiversity, a stable climate, protection against solar radiation and a reliable flow of renewable natural resources. Natural capital is fundamental to the sustainable well-being of societies; it provides the building blocks on which human, social and produced capital ultimately depend. Natural capital accounting is concerned with biophysical measures of the conditions of and changes in renewable resources such as forests; land and soils; air and atmospheric quality; water quality and quantity; fish and wildlife; conservation and preservation of natural habitat and ecosystems; biodiversity; and non-renewable resource stocks and flows such as oil, gas, coal, minerals and metals. Like produced and human capital, natural capital also depreciates in physical and market value terms, thus requiring ongoing investment in time, energy, and other resources to ensure that ecosystems continue to function productively and maintain their flows of natural capital goods and services.

4.2 Starting with Values

Values are at the heart of the quality-of-life measurement issue. Ideally, the values of the individual, households and society should determine the choice of indicators used to measure and manage for the well-being of current and future generations. If what gets measured gets our attention, what we value must ultimately drive what we choose to measure and manage. An assessment of the values of citizens in a community should precede the development and choice of indicators (Figure 2). However, discerning societal values and measuring them consistently over time is a challenge.

Engaging citizens in a dialogue about their belief system and what defines quality of life is critical, and is often neglected in indicator and performance measurement initiatives. This can result in a gap between what an organization might consider important and what stakeholders and citizens consider important.

Figure 2: Values and GPI Accounts



In the absence of a robust process, an initial step is possible where indicators are selected that intuitively align with a common set of values exhibited across many communities. This, however, should be viewed as an interim step in an ongoing process of discerning values, engaging citizens in evidence-based value discussions and measuring those things that people in a community consider contribute to their genuine well-being.

Values can be solicited through surveys, focus group discussions and other public forums. These value assessments may then be used to identify the indicators that should be developed to inform citizens about the condition or state of the issues they value most. This approach is being taken by the Canterbury-Christchurch, New Zealand community where a quality of life survey is now driving the reporting on indicators directly tied to the values and issues expressed as most important to the citizens.

In Canada, Professor Matthew Mendelsohn of Queen's University has also analyzed quality of life surveys of Canadians over time. His objective was to:

> *search academic and commercial surveys of Canadians that were undertaken for four types of questions: 1) how satisfied Canadians were with their "quality of life"; 2) their satisfaction with a number of elements of their lives that we deemed to be important to "quality of life" (e.g., their personal health); 3) their satisfaction with how the system was performing on a number of elements we deemed to be important to "quality of life" (e.g., the health care system); and 4) what things they thought were important to a good quality of life.*[11]

Mendelsohn concludes:

> *There is surprisingly little tracking data on Canadians' quality of life. This is a major shortfall if one is interested in assessing changes in Canadians' quality of*

> *life over time…Canadians' perceptions of their quality of life do not change dramatically over short periods of time, yet long-time series data are not available. It is therefore crucial to create an index that is replicated every year so that the research community can identify real changes in Canadians' perception of their quality of life.*

The Canadian Policy Research Network (CPRN), headed by economist Judith Maxwell, is convinced that the correct approach to quality of life measurement is to engage citizens in a dialogue about quality of life and values. The CPRN has begun such a process and the results could be vital for shaping future indicator development such as the GPI Accounting framework. Comparing values with the current and historical state of conditions in the well-being of the nation or province or community will provide important insights for citizens, policy makers and elected officials.

In the case of the Alberta GPI accounts, no longitudinal values data set from opinion polls was available to guide us on the choice and weighting of indicators. Recent opinion polls might be applicable to more recent GPI accounts but it is not appropriate to apply them to historical accounts.

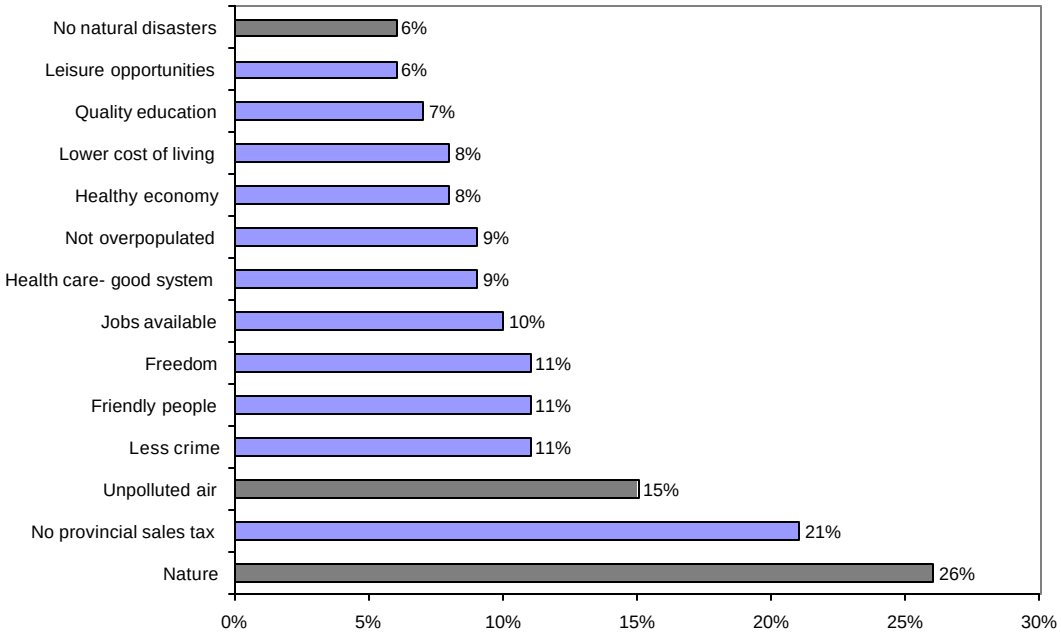
Another source of information on longitudinal attitudes of Albertans comes from the University of Alberta's Population Research Laboratory, which has conducted public opinion polls on numerous issues since 1977. Unfortunately, no consistent set of questions has been posed that could reveal trends in the values or opinions of Albertans on key issues. The questions in these surveys change over time, making it impossible to compare the results. Nevertheless, some questions related to people's sense of hope for their future economic well-being have been asked consistently in surveys since 1977 and may provide some longitudinal data for assessing trends.

Some values surveys worth noting in the case of the Alberta GPI accounts include work from the Alberta Growth Summit and the CPRN.

4.2.1 The Alberta Growth Summit

In 1997, the Alberta Government engaged Albertans in a discussion about the future direction of economic growth, called the Economic Growth Summit. The Summit produced some important results, including a recommendation to conduct GPI analysis as an alternative to the GDP. The Growth Summit began with an assessment of the values and opinions of Albertans, providing one of the best and most current benchmarks about what Albertans consider important to their quality of life. Figure 3 shows the issues that were found through the poll to be most important to Albertans.

Figure 3: What Albertans Value Most (1997)



Source: Alberta Growth Summit, 1997, survey of what Albertans value most

The importance of the natural environment (profile in striped bars) is evident from these results, with 26 percent reporting "nature" as most important, followed by 15 percent reporting "unpolluted air" and 6 percent naming "no natural disasters." Social issues and economic issues shared importance with a particularly high rating for "no provincial sales tax." A "healthy economy" was rated lower than many other variables with 8 percent of respondents considering it of high value. The importance ascribed to some of these issues might provide guidance in terms of weighting the GPI accounts, though we feel that a more comprehensive survey of values and quality of life is necessary to provide a justifiable scoring system.

When asked what the ideal Alberta would look like, respondents put respect for one another, safety and low crime, and low unemployment (job security) at the top of the list (see Table 1).

Table 1: What Would the Ideal Alberta Look Like?

What would the ideal Alberta be like?	% of respondents
Respecting one another	20%
Safety/low crime	18%
Low unemployment	17%
Education – free/affordable	14%
Good health care	14%
No bigotry	11%
Freedom of speech/religion	7%
Honest government	7%
Basic needs met	7%
Strong family values	7%
Clean air and water	6%

4.2.2 Canadian Policy Research Networks: Quality of Life Indicators Initiative

The Canadian Policy Research Networks (CPRN), headed by economist Judith Maxwell, believes that one valid approach to measuring quality of life is to engage citizens in a dialogue about quality of life and values. The CPRN has examined the values of Canadians to

(a) find out what they regard as the essentials of a high quality of life;
(b) create an experimental set of national indicators that reflect what citizens want or value;
(c) test the indicators; and, eventually
(d) contribute to the development of national quality of life indicators that can be used to chart Canada's progress on the things that matter to Canadians (CPRN 2001).

The process and the indicators that citizens identify as meaningful may provide an important tool for developing a values weighting system within GPI accounting systems. Comparing values with the current and historical state of conditions in the well-being of the nation or province or community will provide important insights for citizens, policy makers and elected officials.

The CPRN conducted 40 discussion sessions with 350 Canadians identifying nine quality of life thematic areas and five respective sub-themes per thematic area as well as quality of life indicators that were considered meaningful to these citizens (see Table 2).

Most groups addressed the economy and paid work at some point. In their deliberations about the economy as a whole, nearly half of the groups emphasized the importance of keeping unemployment rates down or a preference for Canada to approach full employment. Other groups talked about creating or sustaining a healthy, growing economy as relevant to the quality of life or providing the requisite employment opportunities to help maintain a certain quality of life. At a more personal level, several groups stressed the importance of employment opportunities as important in their lives and considered it an issue to be monitored. Participants often acknowledged a healthy economy as important to quality of life. Their rationales embodied subtle differences in philosophies, but a common thread involved the notion that a healthy economy served as the fuel needed to operate the broader engine of government and society at large (CPRN 2001).[12]

The results of this work are important for future GPI accounting. The CPRN values could be mapped onto and aligned with the GPIs or indicators of quality of life and sustainability to yield composite GPI well-being indices that are weighted according to the values of Canadians. This could be a means of dealing with one of the weaknesses of the Alberta GPI accounts that include equal weighting of the 51 indicators in constructing composite indices. So often, performance measures chosen by governments or derived by experts fail to capture the attention of citizens because they do not necessarily resonate with what people think matters. The CPRN research is an important step towards a meaningful and practical GPI sustainable well-being accounting system for guiding public policy.

Table 2: Indicators for Quality of Life Issues in Canada, Suggested by Citizens

	Theme	Citizen-Suggested Indicators
1	Political rights and general values	• Civic involvement or democratic participation • Personal responsibility • Equality of opportunity • Extent of long-term planning • Racist or discriminatory attitudes
2	Health	• Illness rates/higher health rates • Access (e.g., health care facilities and professionals) • Natural/alternative health care interventions • Coverage (e.g., drugs, dental care) • Life expectancy rates
3	Education	• High school completion rates • Accessibility and affordability of post-secondary education • Public education funding levels • Teacher-student ratios • School violence rates
4	Environment	• Increased recycling levels • Ozone layer restoration and/or acid rain levels • Local sustainability indicators • Increased neighbourhood cleanliness • Access to and protection of green space
5	Social programs/conditions	• Supports for single parents • Employment training programs • Housing accessibility and affordability • Daycare accessibility and affordability • Social assistance rates
6	Personal well-being	• Financial security • Stress levels • Availability of leisure time • Self-esteem or self-satisfaction measures • Drug/alcohol abuse rates
7	Community	• Volunteer participation rates • Church membership • Poverty and homelessness rates • Social cohesion (e.g., interaction rates with neighbours) • Degree of segregation or cultural isolation
8	Economy and employment	• Employment rate/unemployment rate • Income above living wage • Economic growth rates • GDP less credit card debt • Small business supports and investment
9	Government	• Voter participation rates • Equitable taxation rates • Access to government legislators • Levels of public trust in government (accountability) • Government waste or inefficiency • Measures of responsiveness

Source: Canadian Policy Research Network www.cprn.org

4.3 The GPI Accounting Framework

The main feature of the GPI System of Sustainable Well-being Accounts and their application to Alberta is that they attempt to measure and reveal the physical, qualitative and monetary conditions of human, social, natural, produced and financial capital.

4.3.1 System of Sustainable Well-being Accounts

The GPI accounting system is best represented as an integration of physical and monetary measures of human, social, environmental and economic well-being as shown in Figure 4 and Table 3. A detailed description of the GPI accounts is provided in section 4.4 of this report. More detailed methodological reports for each Genuine Progress Indicator will be released by the Pembina Institute in the coming months.

Figure 4: Genuine Progress Indicator (GPI) System of Well-Being Accounts

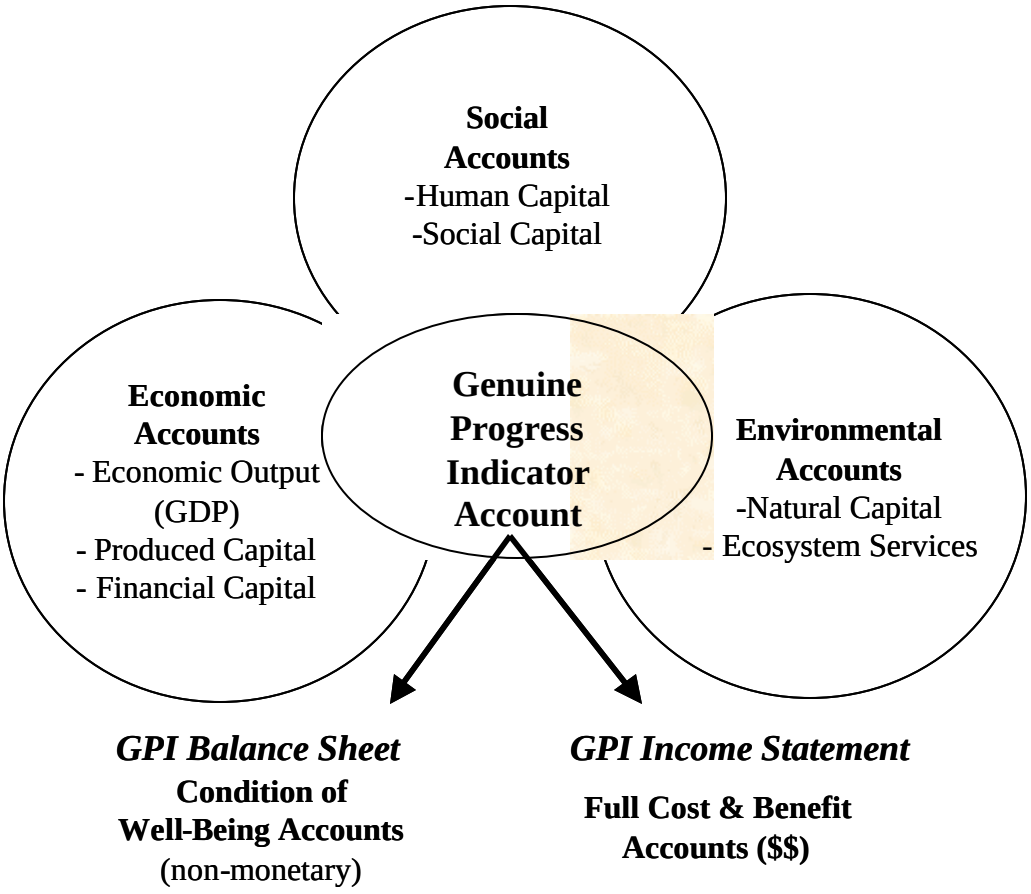


Table 3 shows an example of a prototype GPI Account, which was applied, for the most part, to the province of Alberta, Canada. Such accounts can be constructed in numerous ways, depending on how a community or society defines well-being. The accounts developed for Alberta are only a first step towards a more complete accounting system that aligns with the values of citizens.

Table 3: The Genuine Progress Indicators Accounts

Economic Accounts	Economy	• GDP (gross domestic product) and its components • Trade balance: exports less imports of goods and services
	Livelihood	• Disposable income • Personal consumption expenditures • Debt (household, government, business, farm, student) and net worth • Savings (households, government) • Employment, unemployment, underemployment
	Infrastructure (Produced Capital)	• Household infrastructure • Public infrastructure
	Transportation	• Private, public and commercial transportation (commuting)
Social-Human Health Accounts	Human Capital	<u>Time Use Accounts</u> • Paid work • Unemployment • Unpaid work-time • Unpaid housework, parenting and eldercare <u>Volunteerism</u> • Leisure time • Commuting time
		<u>Health and Wellness</u> • Life expectancy (and self-rated health) • Premature mortality and disease • Suicide (mental health) • Obesity • Auto crashes • Infant mortality and low birth-weight babies • Substance abuse (drugs, alcohol, tobacco) • Problem gambling
	Knowledge Capital	• Educational attainment, knowledge and skills
	Social Capital	• Poverty • Income and wealth inequality (and distribution) • Crime and violence • Family breakdown (divorce) • Democracy
Environmental Accounts	Ecological Footprint Analysis	• Ecological Footprint accounts (food, energy, clothing, transportation) • Material and energy flow analysis
	Natural Capital Accounts	• Non-renewable energy resources and use (oil, gas, coal) • Renewable energy capacity (wind, solar, hydro) • Minerals • Forest sustainability • Wetlands and peatlands • Agriculture sustainability (soil productivity) • Carbon budget • Fish and wildlife • Parks and wilderness
	Ecosystem Services Accounts	• Ecosystem integrity • Air quality • Greenhouse gas emissions and ozone depleting chemicals • Water quality and flow (surface and ground water) • Noise pollution • Hazardous waste • Landfill waste

Other key components of the GPI accounts are a balance sheet and a net sustainable income statement.

GPI Balance Sheet: This is a compilation of the GPI accounts using a traditional balance sheet framework that shows the annual total well-being or condition of assets, liabilities and distribution of wealth (owner's equity) of a society (see Section 4.3.2). These categories are subdivided into human, social, natural and economic capital. Indicators that can be expressed in physical, qualitative and monetary terms are used to construct the balance sheet.

GPI Net Sustainable Income Statement: This is a national or provincial income statement that differs fundamentally from the GDP in that it subtracts from gross output or income (i.e., the GDP) the human, social, and environmental costs (including natural capital depreciation) that contributed to the annual gross income or GDP (see Section 4.3.3). It also recognizes the positive contributions of unpaid work, such as volunteering, child care and housework that lie outside the market yet contribute to well-being. Finally, it recognizes that not all expenditures in the economy represent positive contributions to well-being; some things like automobile crashes, environmental disasters, and suicide should be treated as costs, not revenues as they now are in national income accounts and the GDP.

4.3.2 The GPI Accounts (Ledgers)

The GPI accounts include:

- Physical inventory or data of stocks and flows (quantitative or qualitative) of all forms of capital;
- Monetary accounts (full costs and benefits) of all capital stocks and flows, where monetary (market) values are relevant; and
- Genuine Progress Indicators derived from either the physical inventory or monetary data in the total capital accounts.

4.3.2.1 The Alberta Genuine Progress Indicators

Fifty-one indicators (GPIs) were used to construct the Alberta GPI accounts (see Table 4). The choice of these 51 GPIs was based on the Alberta Government's *Measuring Up* performance measures, the UN's Human Development Index, the World Bank's Total Wealth accounts, and the Index for Social Health (Miringoff and Miringoff 1999).

Table 4: The Alberta GPI Indicators for Economic, Social-Personal and Environmental Well-being

GPI Economic Well-Being Indicators	GPI Social-Human Well-Being Indicators	GPI Environmental Well-Being Indicators
• Economic growth • Economic diversity • Trade • Disposable income • Weekly wage rate • Personal expenditures • Transportation expenditures • Taxes • Savings rate • Household debt • Public infrastructure • Household infrastructure	• Poverty • Income distribution • Unemployment • Underemployment • Paid work time • Household work • Parenting and eldercare • Free time • Volunteerism • Commuting time • Life expectancy • Premature mortality • Infant mortality • Obesity • Suicide • Drug use • Auto crashes • Divorce • Crime • Problem gambling • Voter participation • Educational attainment	• Oil and gas reserve life • Oilsands reserve life • Energy use intensity • Agriculture sustainability • Timber sustainability • Forest fragmentation • Fish and wildlife • Parks and wilderness • Wetland • Peatland • Water quality • Air quality-related emissions • Greenhouse gas emissions • Carbon budget deficit • Hazardous waste • Landfill waste • Ecological footprint

Time-series data were drawn mainly from existing statistical sources including Statistics Canada, the Alberta Government and others. The study covers the period from 1961 to 1999, providing a longitudinal portrait of Alberta's progress on well-being over the past 40 years.

There is no right or wrong suite of measures in a GPI accounting system. The 51 indicators were chosen to illustrate the utility of the GPI accounting system and the capacity to construct such indicators, as well as composite indices, of well-being in a holistic, systems framework. The selection process will undoubtedly result in a bias as to what is considered important to well-being. We acknowledge these shortcomings, which are inherent in most measurement exercises. Ultimately, the choice of measures should be defined through a citizen-based process of identifying and discussing the commonly-held values and vision for well-being. This would have been the first-choice approach for constructing the Alberta GPI accounts, however, time and resources did not allow for this option.

4.3.3 The GPI Balance Sheet (Capital Condition Statement)

Using the information contained in the GPI Account ledgers, a GPI balance sheet (see Table 5) can be constructed showing the current and historical physical conditions of human, social, economic, environmental, financial and produced capital. The GPI Balance Sheet attempts to identify capital in terms of assets, liabilities and the ownership of capital. This is challenging since distinguishing between assets and liabilities as they relate to current and intergenerational well-being is a value laden judgment.

It is nevertheless important for society to identify assets and potential liabilities in this fashion. Potential liabilities (human, social, financial, environmental) may impose future constraints of societal well-being and sustainability. As well, growing inequity in terms of financial wealth and the ownership of land and natural capital can also lead to problems of social cohesion. Because nations and communities generally do not construct such balance sheets, developing the first prototype is a challenge. The Alberta GPI project simply provided a prototype model of a GPI Balance Sheet with an attempt to show the total condition of all capital by converting raw data on the conditions of capital into an index for each of the 51 GPIs. This process is described in more detail in the next section.

Table 5: GPI Balance Sheet Prototype

ASSETS		**LIABILITIES**	
Natural Capital		**Environmental**	
	Renewable Resources		Ecological Footprint
	Agricultural Land		Industrial Footprint
	Wilderness and Parks		Toxic Waste
	Forests		GHG and Carbon Emissions
	Fish and Wildlife	**Human-Social**	
	Water		Income-Wealth Inequality
	Air		Stress
			Suicide
	Non-renewable Resources		Autocrashes
	Oil,Gas Coal		Disease
			Unhealthy Lifestyles (Obesity,Gambling,
	Minerals		Substance Abuse)
		Produced Capital	
	Ecosystem Services		Infrastructure Liabilities
		Financial	
Human Capital			Debt
	Health		
	Intellectual Capital		
	Time (longevity)		
	Spirituality and Hope		
		NET WORTH/OWNERS EQUITY	
Social Capital			
	Social Cohesion		Distribution of Wealth and Power
	Democracy		
Produced/Physical Capital			
	Household Infrastructure and Real Estate		
	Business Infrastructure - Fixed Capital		
	Public Infrastructure		
Financial	Savings (Heritage Savings & Trust Fund)		

4.3.4 Creating GPI indices

One of the important features of GPI accounting is the ability to create indices. Any indexing system can be used to normalize a raw data set of multiple indicators, allowing otherwise incomparable indicators to be compared. Indexing also allows the aggregation of multiple indicators to create composite indices, as we did with the Alberta GPI well-being index.

This indexing system is based on various methodological benchmarks including the UN Human Development Index, the Index for Social Health (Miringoff and Miringoff 1999) and the Edmonton Social Health Index. In all three cases, raw data from an inventory are converted to an index using a numeric scaling process. In this process, a benchmark is chosen

against which longitudinal data are then compared and converted to a numeric score on a scale (e.g., from 1, the poorest condition, to 100, the optimum condition). This conversion of raw data to an index is generally called "normalizing the data set."

Marc Miringoff (1999) at Fordham University showed the value of this approach by devising the Index for Social Health (ISH), which he applied to the U.S. The ISH has subsequently been applied to Canada and its provinces by Brink and Zeesman (1997). The ISH comprises 17 human health and social indicators and the conversion and indexing of a time-series of raw data to a numeric scale. With Miringoff's system, a unique benchmark is chosen for each indicator, based on evidence of the optimal condition over a time series. For example, an indicator for life expectancy would select the longest life expectancy achieved over the time series as the benchmark. All other data points for life expectancy would then be compared with the optimum life expectancy by dividing through the actual raw data in any given time period with that benchmark. This approach to benchmarking and normalizing a data set is particularly attractive since it allows each indicator to be assessed for optimal condition in its own right.

Alternative benchmarking approaches include establishing a common year or time period then converting the raw data set in accordance with that benchmark year. For example, a common year may be selected as the benchmark starting point for normalizing a multiple-variable data set. Trends over time can thus be compared relative to a common starting point. Another approach is to adopt a predefined performance objective or target established by government or others as the benchmark against which current conditions are compared.

To demonstrate the utility of this indexing system, we chose Miringoff's approach, converting original raw data into an index. The most controversial step in the indexing process is the selection of a benchmark for each indicator, since determining what constitutes an optimal or sub-optimal condition of well-being is debatable. Nevertheless, assumptions were made, using common sense and intuition about what is a good or poor condition. Clearly, the shortcoming is the problem of selection bias. For example, should a higher rate of taxation be viewed as desirable or undesirable? The answer is: it depends on your view of taxation. To some, paying more taxes is acceptable if there is a commensurate benefit in public services; to others, paying less tax is desirable. Thus indexing is coloured by the values that a society holds in common. Without a rigorous process of discerning such values we can only posit benchmarks we regard as reasonable starting points for a discussion and subsequent modification as values are revealed.

The Alberta GPI indices were constructed for each indicator by taking the original raw data set then normalizing the data on a scale from 1 to 100. A score of 1 suggests the poorest condition over time and a score of 100 suggests the best condition. In benchmarking the Alberta GPI data set we concerned ourselves only with an examination of Alberta.

Ideally, we would compare Alberta's performance across all 51 indicators with that of other provinces or nations. The same benchmarking approach would apply except that the optimal well-being benchmark might be another community over the same time series. This would yield a different set of GPI indicator scores from those derived by looking at Alberta alone.

The indices derived from raw data allow us to compare trends in other incomparable indicators of well-being and also to create composite or aggregate indices composed of a family of measures. Determining the importance of individual indicators within an aggregate index is complicated by the fact that values differ among individuals.

For the sake of simplicity and in the absence of clear values for Albertans, we opted to give equal weighting to all 51 Alberta GPIs. Had we attempted to assign greater weight to one or more indicators in the data set, we would have been criticized for selection bias. We believe our approach was reasonable under the circumstances. Moreover, the GPI accounting system allows for "what if" weighting scenarios to be played out.

An example of how the indexing system works is shown using the suicide indicator in the Alberta GPI accounts (Table 6).

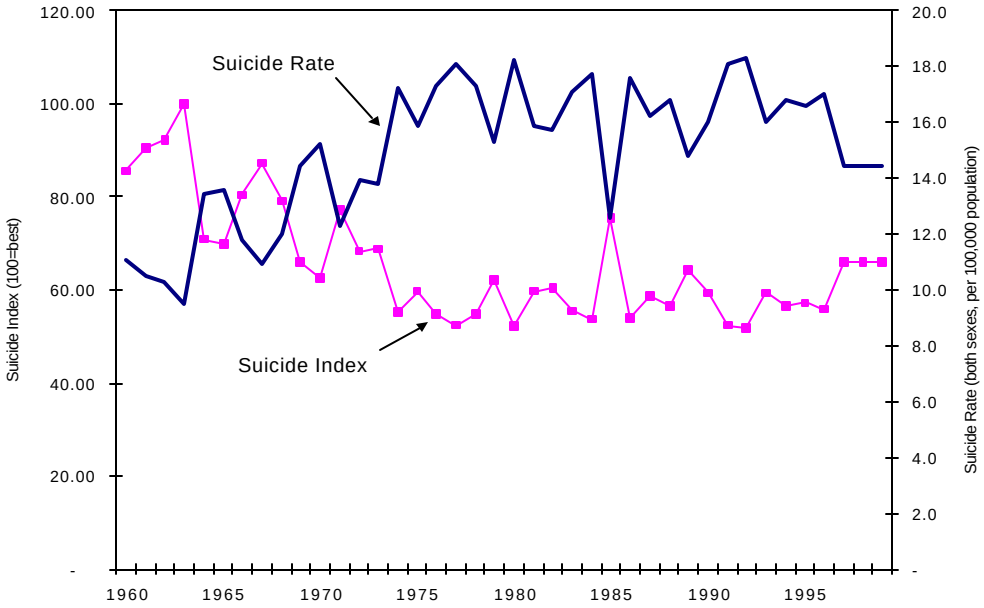
Table 6: Suicide Index

Year	**Suicide Rate (raw data)** Suicide rate for both sexes per 100,000 population	**Suicide Index** Benchmark is lowest suicide rate in Alberta over study period, 1964
1961	11.1	85.59
1962	10.5	90.48
1963	10.3	92.23
1964	9.5	100.00
1965	13.4	70.90
1966	13.6	69.85
1967	11.8	80.51
1968	10.9	87.16
1969	12.0	79.17
1970	14.4	65.97
1971	15.2	62.50
1972	12.3	77.24
1973	13.9	68.35
1974	13.8	68.84
1975	17.2	55.23
1976	15.9	59.75
1977	17.3	54.91
1978	18.1	52.49
1979	17.3	54.91
1980	15.3	62.09
1981	18.2	52.20
1982	15.9	59.75
1983	15.7	60.51
1984	17.1	55.56
1985	17.7	53.67
1986	12.6	75.40
1987	17.6	53.98
1988	16.2	58.64
1989	16.8	56.55
1990	14.8	64.19
1991	16.0	59.38
1992	18.1	52.49
1993	18.3	51.91
1994	16.0	59.38
1995	16.8	56.55
1996	16.6	57.23
1997	17.0	55.88
1998	14.4	65.97
1999	14.4	65.97

In this case, the lowest rate of suicide in Alberta (9.5 per 100,000 people) was set as the benchmark for optimum condition for this indicator—the year 1964. The raw data score of 9.5 suicides per 100,000 people is normalized or converted to an index by dividing 9.5 by 9.5 and multiplying by 100. The benchmark rate of 9.5 was then divided by all subsequent annual suicide rates multiplied by 100 to yield a normalized index score.

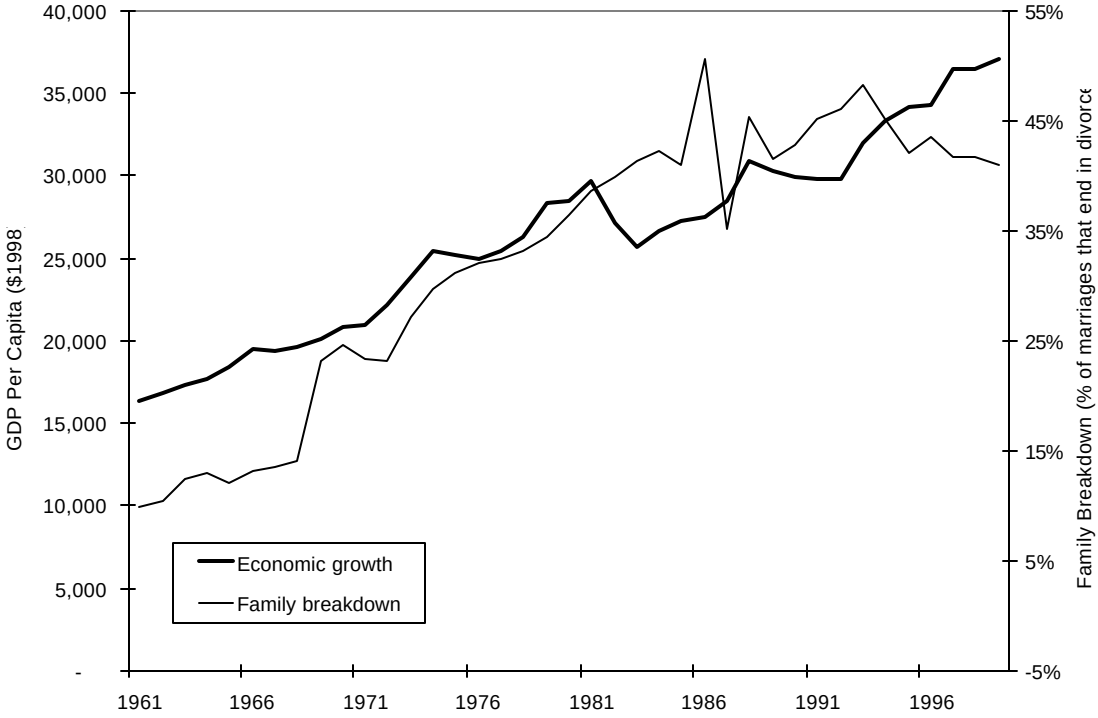
The result is that changes or trends in the actual condition (raw data) for suicide can be seen in comparison with the index (Figure 5). This figure shows the optimal (lowest) rate of suicide as 1964. The trends in individual or multiple indicators can be compared over time. For example, we can answer the question, "How did economic growth track suicide rates over the last 40 years?"

Figure 5: Alberta Suicide Index and Suicide Rates



Another feature of the GPI accounts is that they allow users to compare various indicators against each other, in terms of raw data (see Figure 6, which compares divorce rate trends with GDP per capita) and in terms of indices.

Figure 6: Alberta GDP per capita versus Family Breakdown (Divorce Rates), 1961 to 1999



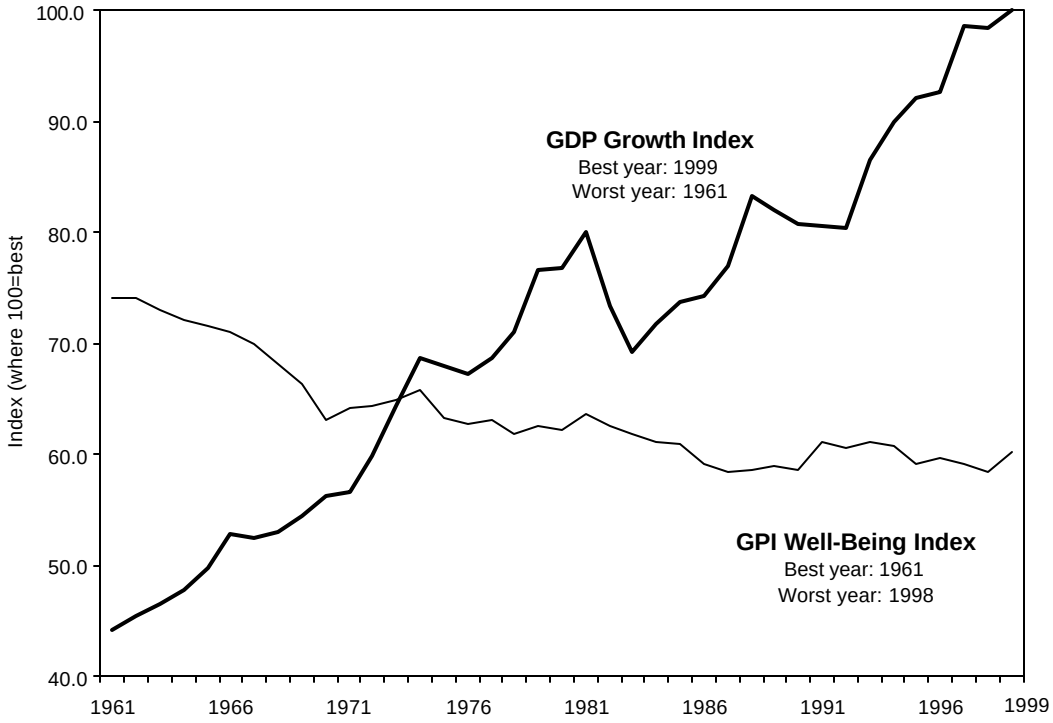
Source: Statistics Canada, CANSIM special retrieval and Alberta Economic Accounts 1999

Because indexing allows for the aggregation of one or more GPI indicators into composite indices by subject category (e.g., economy, society, environment) or as a composite GPI well-being index that uses all 51 GPIs, it enables decision makers to answer such questions as:

> "If economic growth was up, how did the overall well-being of the economy, society and environment change over the same time period?"

The answer to that question might be shown as indicated in Figure 7, which compares the GPI Index for Alberta with the GDP per capita index (based on our preliminary findings). The graph suggests that as the economy grew progressively in terms of GDP per capita, overall genuine progress or well-being was rather stagnant. We could also create separate GPI indices according to the three themes of economy, society and environment. Or we could mix and match various indicators to assess correlations and possible relationships.

Figure 7: Alberta GPI Index vs. GDP Index, 1961 to 1999



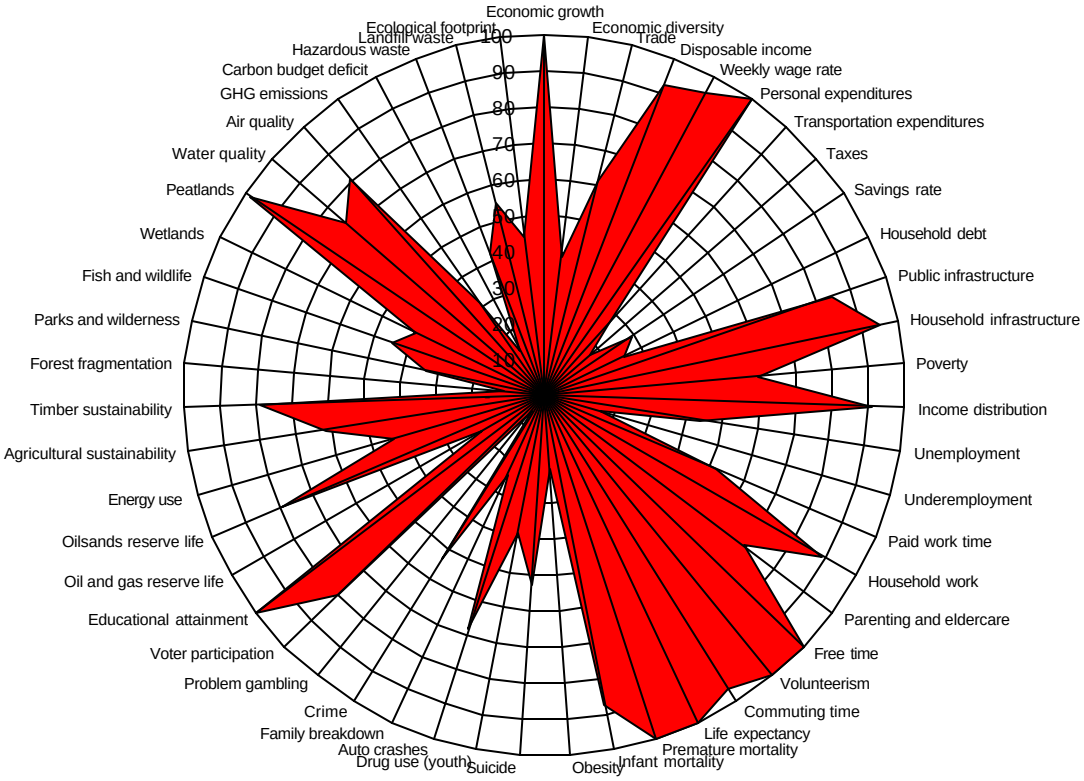
Source: Alberta GPI Accouns 1961-1999

Another creative way of presenting the "condition" statement of the well-being of a society is to present an integrated picture of well-being by comparing the scores of all 50 indicators simultaneously.

Figure 8 illustrates a composite GPI Indicator Account portrait—a kind of holistic "balance sheet"—for the year 1999. This GPI Sustainability Circle is a visual image of the condition of each of the 50 indicators relative to either a benchmark year or other best-performance benchmark.

Those GPI indicators that reflect an optimal state of well-being would score a perfect 100 points, thus their performance would be plotted at the outer edge of the Sustainability Circle. Indicators with a less-than-perfect score would be plotted along an axis from 1 (worst performance, near the centre of the circle) to 100. A perfect GPI Sustainability Circle would be completely filled to the outer edges of the circle. This approach to showing visually the condition of all wealth or well-being in a society is a powerful tool for communicating a number of complex issues.

Figure 8: Alberta GPI Sustainability Circle Index for 1999



Individual GPI Sustainability Circles can be constructed by year, thus identifying which year had the best performance across all GPI categories.

Among other things, the GPI Circle index shows that although economic growth has been robust, savings rates are low, taxes are high, and household debt is high. For social and human well-being conditions, life expectancy has increased, premature mortality is lower, and income is more evenly distributed.

Just as corporations and organizations measure the state or condition of their capital and depreciation costs, their liabilities and net worth in a balance sheet format, so too would the nation, province or local community.

Unlike financial balance sheets, the GPI Balance Sheet does not "balance" *per se*, given that the accounts are expressed largely in non-monetary terms—that is, qualitative conditions. This is, however, not unlike a steel company or oil company reporting its inventory of steel or its economic reserves of oil and gas. Determining what constitutes a liability to the sustainability of society is also a challenge and would require considerable debate. Our Alberta GPI balance sheet is meant to provide a starting point for discussion and future refinement.

The GPI circles can also be constructed according to the three sustainability themes. Figures 9, 10 and 11 show preliminary results for the condition of the Economy, Society and Environment for the year 1999 in Alberta.

Figure 9: Economic GPI Sustainability Circle

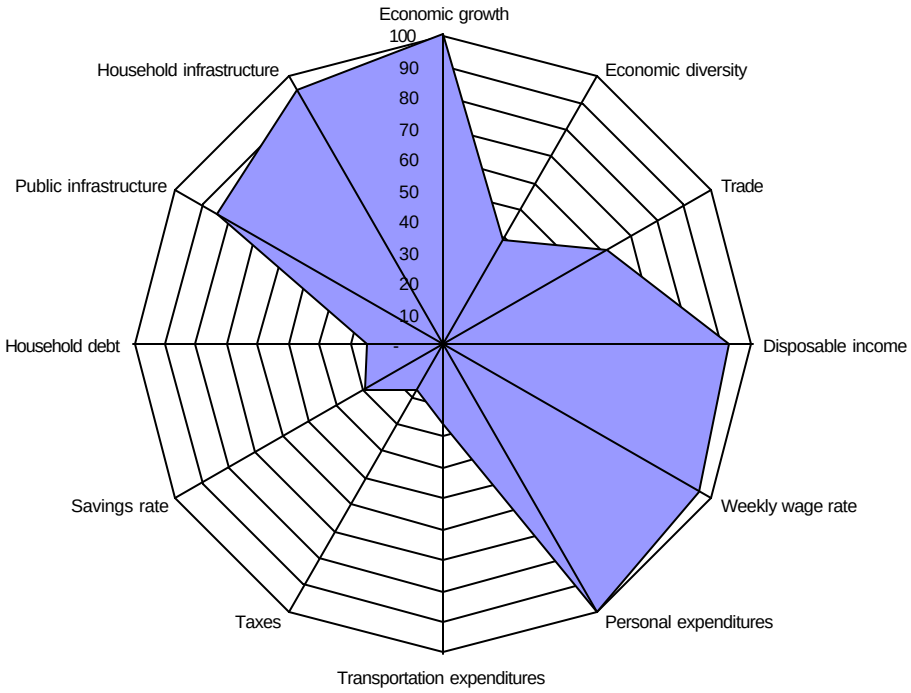


Figure 10 Social GPI Sustainability Circle

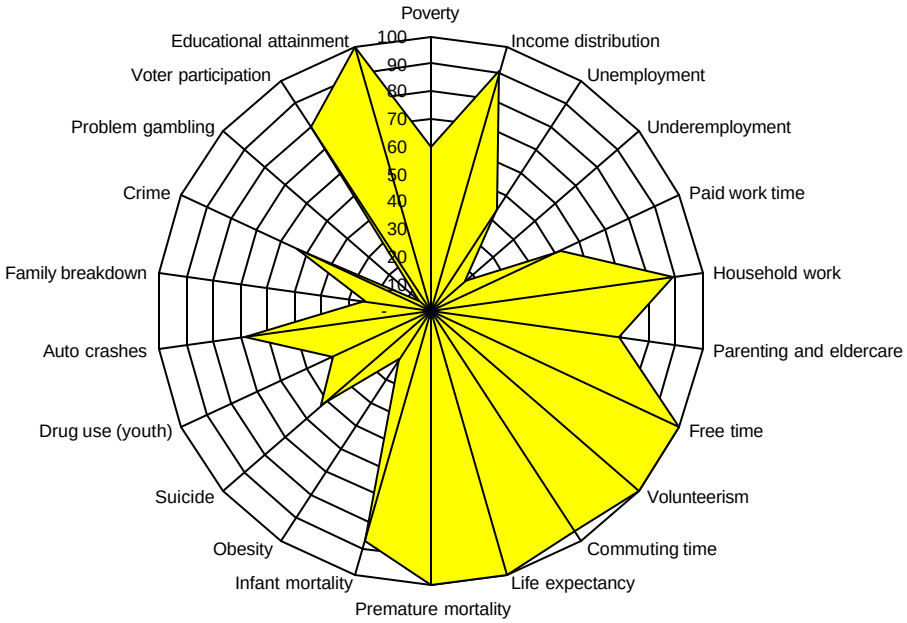
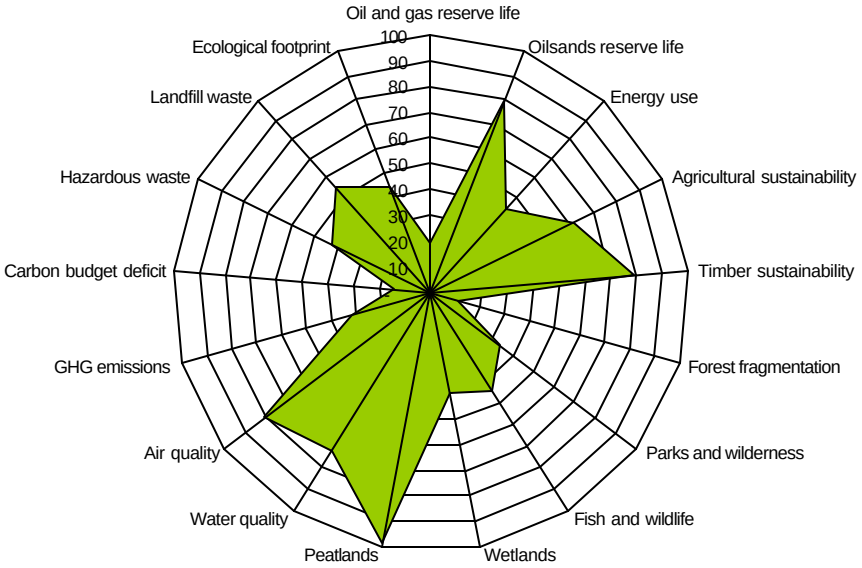


Figure 11: Environment GPI Sustainability Circle



Another way of presenting the evidence is in the form of a GPI report card. Table 7 shows the conditions of well-being, using the 51 GPIs, for 1999 and for the highest and lowest index years for the study period; it also shows the long-term trends of changes in conditions, using arrow symbols. The evidence contained in the GPI accounts can be used as the basis for reporting to citizens about the conditions and sustainability of their province or nation, just as corporations report to shareholders through annual performance reports. The information contained in the GPI accounts challenges us to consider how we might improve our stewardship of real wealth to ensure a sustainable future in the 21st century.

Table 7: The Alberta GPI Sustainability Condition Report Card for 1999 and Well-being Trends, 1961 to 1999

ECONOMIC WELL-BEING Genuine Progress Indicators	**GPI Condition Index in 1999 (100 = best) (0 = worst)**	**Highest Index Year / Worst Index Year***	**Trend in the GPI variable 1961-1999**	**Description of Trend**
Economic growth (real GDP per capita)	100	1999 1961*		The economy (real GDP, 1998$) grew 400% in 40 years, representing a growth rate of 4.4% per annum or 2.2% per capita.
Economic diversity (distribution of GDP)	38	1971 1983*		Alberta's economy was more diversified in 1999 than in 1985 but less diversified than in 1971.
Trade balance (exports less imports)	61	1996 1971*		The balance of exports to imports has been variable, though slightly improved.
Real disposable income	92	1981 1961*		Higher than in the 1960s and 1970s but virtually unchanged since 1984.
Real weekly wage rate	95	1982 1964*		Real weekly wages while higher in 1999 compared to the 1960s have been stagnant since 1984.
Personal consumption expenditures	100	1999 1961*		Real spending per capita grew at 2.0% per annum.
Transportation expenditures	26	1961 1997*		Real transportation expenditures per capita are growing at 3.8% per year.
Taxes	17	1961 1999*		Average annual growth of real taxes per capita was 5.1% per annum.
Household and personal debt (per capita)	25	1961 1999*		Household and personal debt is growing at 3.8% per capita per annum.
Savings rate	26	1982 1970*		Savings rate fell to 7.5% from a high of 27% in 1982, but was higher than in 1960s
Public infrastructure (value of services)	84	1990 1964*		Value of services increased at 0.6% per annum per capita.
Household infrastructure	94	1989 1961*		Value of services from household appliances and infrastructure has been increasing at 3.3% per capita per annum.
Economic GPI Index	**63**	**1985 1970***		The GPI Economic Index has increased at 0.4% per annum since 1961, but stagnated since then.

PERSONAL and SOCIETAL WELL-BEING Genuine Progress Indicators	**GPI Condition Index in 1999 (100 = best) (0 = worst)**	**Highest Index Year / Worst Index Year***	**Trend in the GPI variable 1961-1999**	**Description of Trend**
Poverty (percentage living below LICO – low income cut-off)	59	1981 1992*		Rate of poverty was higher in the 1990s than the 1960s but is largely unchanged since 1981.
Income distribution	90	1989 1961*		The distribution of income is more even in the 1990s, but the gap between the earned (market) income of the rich and poor is widening.
Unemployment (rate)	44	1966 1984*		Unemployment is higher than in the 1960s and '70s but has fallen since 1993.
Underemployment	16	1966 1993*		Underemployment, while lower since 1993 is significantly higher than in the 1960s and '70s.
Paid work (time use)	52	1961 1998*		Total hours of paid work per worker have steadily declined since 1961.
Household work (time use)	89	1997 1982*		Hours spent at housework per Albertan were up only slightly in the latter part of the 1990s compared to the '60s.
Parenting and eldercare (time use)	69	1966 1986*		Albertans spend less time (60 hours less per year) with children and parents than ever before.
Free (leisure) time (time use)	100	1999 1961*		Albertans have more slightly more hours of free time (leisure) than before.
Volunteer time (time use)	100	1999 1986*		The hours spent volunteering has remained virtually unchanged at roughly 66 hours per person per year.
Commuting time (time use)	96	1961 1992*		Time spent commuting to and from work was up slightly in the 1990s compared to the '60s but is effectively unchanged
Life expectancy	100	1999 1961*		Albertans are living longer than ever.
Premature mortality	100	1999 1974*		Premature mortality (from all causes except suicide) is declining, since peaking in 1974.
Infant mortality	87	1997 1970*		Infant mortality has declined significantly since the 1960s (an improved condition)
Obesity	21	1985 1999*		Obesity and overweight conditions are rising steadily.
Suicide	66	1964 1993*		Suicide is much higher than in the 1960s, peaking in 1993 and moderating slightly since then.
Youth drug use	39	1983 1999*		Youth drug use shows a slight increase since 1968.

PERSONAL and SOCIETAL WELL-BEING Genuine Progress Indicators	**GPI Condition Index in 1999 (100 = best) (0 = worst)**	**Highest Index Year / Worst Index Year***	**Trend in the GPI variable 1961-1999**	**Description of Trend**
Auto crashes	68	1961 1981*		Auto crashes per adult Albertan increased until about 1990 and have since declined.
Divorce and family breakdown	24	1961 1986*		The percentage of marriages that ended in divorce was higher at 41% in 1999 than in the 1960s (10%).
Crime	54	1962 1991*		The rate of crime rose steadily, peaking in 1991, and declining since then.
Problem gambling	6	1973 1999*		With access to more legalized gambling, the cost associated with problem gambling is increasing dramatically.
Voter participation	80	1967 1997*		Fewer eligible voters are casting votes in all elections than at any time in history.
Educational attainment (intellectual capital)	100	1999 1961*		More adults (54% of the adult population) had some post-secondary education in 1999 than ever before.
Societal GPI Index	**67**	**1962 1988***		The GPI Personal and Societal Well-being Index has declined an average rate of 0.7% since 1961, although it moderated in the latter part of the 1990s.

ENVIRONMENTAL WELL-BEING Genuine Progress Indicators	**GPI Condition Index in 1999 (100 = best) (0 = worst)**	**Highest Index Year / Worst Index Year***	**Trend in the GPI variable 1961-1999**	**Description of Trend**
Conventional crude oil and natural gas reserve life	20	1966 1999*		Natural gas and conventional crude oil reserves continue to decline, with replacements not keeping pace with extraction.
Oilsands reserve life	79	1979 1998*		Oilsands reserves are relatively constant given that there an estimated 300 billion barrels of economic reserves of oil that could last hundreds of years.
Energy use	44	1962 1999*		Total energy demand (intensity of use) continues to rise at a rate of 2.2% per annum, per capita, similar to the GDP per capita.
Agriculture sustainability	62	1999 1961*		The agriculture sustainability index (a composite index of yields, soil organic carbon, summer fallow, pesticide use and salinity) increased somewhat in the 1980s and '90s. However, increasing farm debt, and fertilizer and pesticide use may become problematic.
Timber sustainability	79	1994 1998*		The Timber Sustainability Index (ratio of timber growth to all timber capital depletions) continues to decline, falling below sustainable thresholds in 1998 and 1999.
Forest fragmentation	11	1961 1999*		The fragmentation of Alberta's forests (due to industrial development) has risen so dramatically since the 1960s that an estimated 90% of Alberta's vast productive forest land base is now fragmented.
Parks and wilderness	33	1999 1995*		While the area of parks and wilderness under protection has increased slightly, not all landscape types are adequately represented.
Fish and wildlife	45	1980 1999*		Caribou populations are falling; grizzly bear populations are uncertain, and sport and commercial fisheries are declining.
Wetlands	40	1961 1999*		Area of wetlands has declined at an estimated 0.6% per year since 1961.
Peatland	99	1961 1999*		The area and volume of peatland is largely unchanged.
Water quality	73	1999 1986*		Overall water quality (a composite index of pulp effluent, sewage treatment, water-related illness and river water quality) has improved. However, river water quality shows a slight decline and groundwater conditions are uncertain.

ENVIRONMENTAL WELL-BEING Genuine Progress Indicators	**GPI Condition Index in 1999 (100 = best) (0 = worst)**	**Highest Index Year / Worst Index Year***	**Trend in the GPI variable 1961-1999**	**Description of Trend**
Air quality	80	1997 1972*		The Air Quality Index (includes SO_2, CO_2, VOC, NOx and PM) has improved. However, some emissions are showing increases, and particulate matter is a health concern.
Greenhouse gas (GHG) emissions	31	1962 1996*		GHG emissions have risen an estimated 3.2% per capita, per annum since 1961.
Carbon budget deficit	14	1974 1998*		Alberta carbon budget deficit (the relationship between CO_2 emissions to the annual carbon storage by the environment) has increased at 5.4% per annum from 1961-1999, but slowed in the '90s.
Hazardous waste	42	1974 1998*		The volume of hazardous waste increased three fold between 1991 and 1999. Alberta ranked third highest among Canadian provinces for releases of pollutants to air, water, landfill and underground in 1997.
Landfill waste	55	1995 1991*		As a result of recycling efforts, waste to landfills has decreased somewhat, but the target of a 50% reduction by 1999 was not met. Alberta has the lowest rate of recycling and reuse in Canada (17%).
Ecological Footprint	44	1961 1997*		The ecological footprint of each Albertan is increasing at a rate of 1.4% per year with a 1999 footprint roughly six times larger than the average global carrying capacity.
Environment GPI Index	**44**	**1962 1970***		The Environment GPI Index has declined steadily at a rate of 1.0% per annum since 1961.

Alberta GPI Index	61	1961 1998*		The overall GPI Index for Alberta has declined an average 0.5% per annum from 1961-1999, though it moderated slightly in the 1990s.
Alberta Economic Growth (GDP) Index	100	1999 1961*		Total Alberta real GDP has grown at an annual real rate of 4.4% since 1961; real GDP per capita has grown 2.2% per annum.

4.3.5 The GPI Net Sustainable Income Statement

The "GPI Net Sustainable Income Statement" is similar to the U.S. GPI and the ISEW developed by John Cobb Jr., Herman Daly, and Clifford Cobb in 1995 and 1989 respectively (see a prototype in Table 8). The GPI income statement represents the monetary expression of economic well-being consistent with the first GPI and ISEW measurement efforts. The methods adopted for constructing the Alberta GPI net sustainable income statement are based, in part, on the U.S. GPI methodology handbook (Anielski 1999) and the Australian GPI (Hamilton 2000). Estimates for Alberta's GPI net sustainable income statement cover the study period 1961 to 1999.

Like the U.S. GPI and Australian GPI, the Alberta GPI accounts include a GPI net sustainable economic welfare line (a "revised" GDP) to compare with the GDP over time. As has been shown in the U.S. and Australian GPI work, a rising GDP over 50 years of accounting stands opposed to a declining (U.S) or stagnant (Australia) monetary GPI.

The GPI income statement adjusts GDP for some of the full costs and benefits of human, social and environmental impacts of economic growth. GPI accounting seeks to examine economic growth in terms of the factors that lie outside of or are measured incorrectly or not at all in national accounts. For example, the time spent by individuals and households at unpaid work such as parenting, housework and volunteering is not valued at all in the national accounts or GDP. Other important components are similarly not counted, including the value of services from public and household infrastructure, the value of natural capital (petroleum resources, forests, agricultural soils), and the value of ecological services (watersheds, air sheds, ecosystems). Not accounting for the depreciation value of natural capital as it is extracted or used up is simply poor capital accounting. The other perversion of national accounting is that it considers expenditures on crime, suicide, auto crashes and other social ills (what the GPI regards as "regrettable" expenditures) as a monetary contribution to GDP. Intuitively, it makes no sense to count such ills as genuine progress.

A GPI income statement attempts to identify *unaccounted-for benefits* that contribute to genuine well-being, and *regrettable expenditures* that common sense tells us are "costs" of progress rather than genuine contributions.

A GPI income statement is much like the income statement of a firm. It consists of gross revenues (benefits) and a series of costs, including the cost of capital depreciation. What is unique to the GPI income statement is that unaccounted benefits are included, and capital encompasses not only produced capital but also human, social and natural capital. Since there are no generally accepted accounting principles to guide us, the first prototype GPI income statements will be crude and preliminary. Of course, creating a GPI income statement for a nation is more complicated than generating an income statement for a business. However, any marginal improvement to the nation's income statement, which in principle is a one-line item called the GDP (akin to a firm reporting only total revenues), is real progress in national accounting.

In the GPI income statement, an attempt is made to identify unaccounted-for benefits that contribute to genuine well-being, and regrettable expenditures that common sense tells us are "costs" of progress rather than genuine contributions. For example, unlike the GDP, the GPI

income statement considers expenditures on a home security system as a regrettable cost for people and communities living in fear of crime. Thus expenditures on home security systems would be treated as a negative rather than a positive contribution and would be deducted from the GDP. The economic value (based on economic rent calculations) of depleting non-renewable oil and gas reserves would be treated like any depletion from a finite stock of inventory; that is, as a depreciation cost against income. At the same time, the economic value of depleting renewable resources at rates that deplete the original capital stock (e.g., forests or agricultural land productivity) thus jeopardizing long-term sustainability of natural capital flows would be treated as a cost against GDP. Other perversions can contribute to a sudden jump in state or provincial GDP—such as the Exxon Valdez oil spill or natural disasters like tornados or the ice storms in Ontario and Quebec. The jump would go largely unexplained in next year's economic news of GDP growth, yet common sense says the growth was based on a regrettable event.

Another consideration in the GPI income statement is the nature of government expenditures. Some government expenditures such as health care or education presumably improve the collective well-being of all citizens, but in other cases (e.g., drug addiction counseling, government debt servicing or environmental pollution remediation) these expenditures may be viewed as regrettable or "defensive" expenditures; that is, they are made in reaction to or in defense of a regrettable loss in the condition of human, social or environmental well-being.

Many possible adjustments could be made to devise a more transparent GDP statement. The biggest challenge is gathering the necessary expenditure and depreciation cost data to complete such a statement. However, such estimates are possible, as has been demonstrated in constructing the U.S. and Australian GPI, and now in the case of the Atlantic GPI initiative for Nova Scotia. The Alberta GPI follows in this tradition.

The importance of presenting a revised GDP account to reflect human, social and natural capital costs of declining conditions or unsustainable paths is obvious. Consider, for example, a future finance minister's budget. Along with projections of economic growth, the budget might also reflect on last year's GDP growth that resulted from productive economic activity **and** from regrettable social and human health costs **and** from the depletion of natural capital stocks or environmental pollution clean-up costs. This would make more transparent the reality that even though GDP may be up, other factors of genuine well-being might require attention and investment.

With a more holistic and transparent perspective on economic growth, a more robust picture of progress and well-being would emerge, leading to a healthier and more enlightened debate about quality of life and government budgets. This is the goal of GPI accounting. Indeed, some might argue that identifying key expenditure drivers of GDP growth is perhaps the most important benefit of GPI accounting. This was clearly the main success of the original U.S. GPI studies.

Examining the actual structure of the GPI income statement (Table 8), we begin with the gross expenditures of households, or personal consumption expenditures. This is the largest component of GDP and is presumed to correlate with economic well-being of households, which is the focus of our accounting. Accepting the premise that consumption spending contributes to genuine well-being (which is debatable), we then make a series of additions and deductions against our "gross" expenditure starting point. That said, the monetary GPI is strongly biased upwards because of the presumption regarding consumption expenditures and because rising personal consumption expenditures also raise the GDP, depending on their

relative importance to an economy's GDP. Of course, much of what we count as personal consumption expenditures may not represent genuine improvements in our well-being and quality of life at all. Indeed, they may simply be an account of money circulating in an economy chasing goods and services that most households don't need beyond a certain level of sufficiency.

Proceeding from personal consumption expenditures we adjust for income inequality on the premise that rising income inequality erodes social cohesion and overall societal well-being. We then add unaccounted-for benefits including the opportunity labour cost of unpaid work and the value of services from public and household infrastructure. We then deduct regrettable costs and depreciation costs of natural, social and human capital, arriving at a GPI Net Sustainable Income line expressed in monetary terms for any given operating year.

Table 8: Components of the Alberta GPI Net Sustainable Income Statement

Gross Revenues, Expenditures or Output (Personal Consumption Expenditures)	
Adjust for Income Distribution (inequality using the Gini coefficient)	
ADD: Unaccounted Benefits	• Non-defensive public/government expenditures • Value of services of consumer durables • Value of public infrastructure/capital services • Net capital investment • Value of housework • Value of parenting and eldercare • Value of volunteer work • Value of free time
SUBTRACT:	
Regrettable Social Costs	• Cost of household and personal debt servicing • Cost of consumer durables (depreciation) • Cost of unemployment • Cost of underemployment • Cost of auto crashes and injuries • Cost of commuting • Cost of crime • Cost of family breakdown • Cost of suicide • Cost of problem gambling • Cost of substance abuse (drugs, alcohol, tobacco)* • Cost of obesity and unhealthy lifestyles*
Regrettable Environmental Costs and Natural Capital Depreciation	• Cost (depreciation) of nonrenewable energy resources (oil, gas, coal) • Cost of non-timber forest values due to changes in productive forest land • Cost of unsustainable timber resource use • Cost of agriculture land degradation (erosion of bare soil on cultivated land) • Cost of air pollution • Cost of climate change damage (greenhouse gas emissions) • Cost of loss of wetlands • Cost of water pollution (human wastewater) • Non-market costs of toxic waste liabilities • Non-market cost of municipal landfill waste
= GPI Net Sustainable Income (Net Beneficial Output)	

* While these social costs are identified as part of the GPI Net Sustainable Income statement they were not explicitly calculated for the Alberta GPI accounts

The GPI accounts make the GDP more transparent by identifying the full costs and benefits of capital consumption. For example, as seen in Table 9, the GPI income statement shows that the monetary value of unpaid work (housework, parenting, volunteerism) in Alberta amounted to $38.8-billion, or 35.4 percent of Alberta's GDP in 1999—benefits that are not counted in the GDP. Furthermore, social costs such as underemployment, auto crashes, crime, divorce, suicide, and problem gambling, which totaled an estimated $23.4-billion in 1999, or 21.3 percent of GDP, are treated as economic gains rather than regrettable costs. Adding up the costs of natural capital depletion and environmental costs of pollution amounted to $26.4-billion, or 24.0 percent of GDP. The result is a new bottom line that considers which expenditures and income in society contribute to sustained economic welfare.

This methodological approach is based on the U.S. GPI methodology (Anielski and Rowe 1999), the Australian GPI (Hamilton 2000) and the important work by Dr. Ron Colman and team with GPI Atlantic. Valuation modifications for the Alberta GPI income statement were made consistent with Canadian or Alberta values, costs and benefits, drawing from research studies, Statistics Canada data and Alberta Government expenditure data. Some of our estimates of costs and benefits were based on GPI Atlantic's estimates for Nova Scotia.

The methods used to derive both benefit and cost estimates for each of the components of the GPI income statement for Alberta are contained in the detailed Alberta GPI background reports (28 separate reports, see Appendix A) that supplement the *Alberta Sustainability Trends 2000* report.

We recognize that many opportunities exist to improve the valuation methods necessary for developing rigorous GPI income accounts. Given our experience in the U.S. GPI analysis, we also recognize that many methodological and conceptual biases and controversies with the original U.S. GPI work have not, for the most part, been fully debated or resolved.[13]

The results of the Alberta GPI net sustainable income statement for 1999 are shown in Table 9. The Income Statement complements the GPI Balance Sheet, which shows the physical condition of all capital, and contains important information that policy makers can use in their planning and budgeting activities.

Table 9: Alberta's GPI Net Sustainable Well-Being Income Statement for 1999, in millions of 1998 dollars

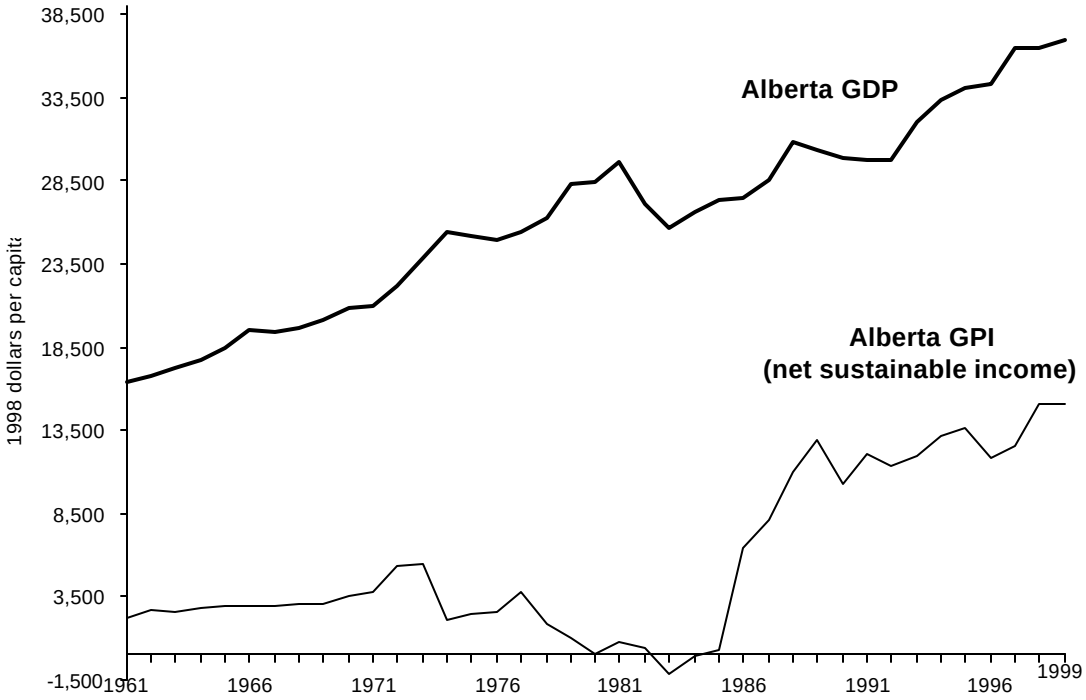
Alberta GPI Income Statement for 1999

($ million 1998 dollars)		$ millions (1998 dollars)	% of GDP
Gross Domestic Product (expenditure-based)		109,708.43	
Personal consumption expenditures		52,838.59	48.2%
Consumption expenditures adjusted for income distribution		47,957.49	43.7%
Non-defensive government expenditures		7,727.89	7.0%
Value of Services of Consumer Durables		5,532.50	5.0%
Value of public infrastructure services		1,660.96	1.5%
Net capital investment		(864.64)	-0.8%
Cost of household and personal debt servicing		(6,433.77)	-5.9%
Value of unpaid time use			
Value of housework	32,907.30		30.0%
Value of parenting and eldercare	3,291.54		3.0%
Value of volunteer work	2,631.30		2.4%
Value of free time	0.06		0.0%
		38,830.19	35.4%
Social Costs			
Cost of consumer durables	(7,998.17)		-7.3%
Cost of unemployment and underemployment	(3,823.98)		-3.5%
Cost of auto crashes	(3,026.43)		-2.8%
Cost of commuting	(4,406.03)		-4.0%
Cost of crime	(1,833.23)		-1.7%
Cost of family breakdown	(147.96)		-0.1%
Cost of suicide	(2.43)		0.0%
Cost of gambling	(2,167.50)		-2.0%
		(23,405.73)	-21.3%
Environmental Costs			
Cost of non-renewable resource use	(10,656.30)		-9.7%
Cost of non-timber forest values due to change in productive forest	(23.78)		0.0%
Cost of unsustainable timber resource use (loss in pulp production value)	(14.60)		0.0%
Cost of erosion on bare soil on cultivated land (on-site only)	(12.78)		0.0%
Cost of reduction in yields due to salinity on dryland and irrigated cropland	(58.15)		-0.1%
Cost of air pollution	(3,666.00)		-3.3%
Cost of GHG (damage of climate change)	(4,073.33)		-3.7%
Cost of loss of wetlands	(7,682.01)		-7.0%
Environmental cost of human wastewater pollution	(0.57)		0.0%
Non-market cost of toxic waste liabilities	(4.71)		0.0%
Non-market cost of municipal waste landfills	(190.10)		-0.2%
		(26,382.33)	-24.0%
GPI (Net Beneficial Output), with debt servicing costs		36,999.62	
GPI (Net Beneficial Output), without debt servicing costs		*43,433.40*	
GPI (with debt) per capita		12,480.10	
GDP per capita		37,005.04	

The bottom line derived from a GPI Income Statement is essentially the "net sustainable income" bottom line, similar to the U.S. GPI estimate of sustainable economic welfare. It tells us whether we are running an annual "surplus" or "deficit" in genuine progress—whether we are living sustainably off the interest or eroding the capital stock. The GPI Income statement combined with the GPI Balance Sheet allows us to then better budget for investing in sustainability of all capital.

Figure 12 below compares real GDP per capita with the GPI net sustainable income results. It shows that while GDP has risen steadily since 1961, the GPI income line was stagnant through the 1960s and recovered after 1986 as the importance of oil and gas diminished and the value of unpaid work rose significantly.

Figure 12: Alberta GPI Net Sustainable Income vs. GDP per capita, 1961 to 1999, 1998$



Source: Alberta GPI Accounts, GPI income statements, 1961-1999

The key challenge in the GPI Income Statement, as with GPI accounting in general, is determining whether a value being accounted for is a regrettable cost or true depreciation of wealth, capital or well-being. For example, some people might view commuting to work as a desirable expenditure of their time while others find commuting regrettable and undesirable. A GPI at a regional scale should reflect the values held in common by most households, recognizing there will always be differences of opinion.

4.4 The GPI Accounts in Detail

The GPI accounts consider financial well-being at the individual and household level. This includes real disposable income, expenditures (broken down by categories), debt (individual, household, farm, business and government), taxes and the value of services of household infrastructure and durables. This section describes the GPI accounting architecture in more detail. Additional information on GPI accounting methodologies is contained in the GPI background reports published by the Pembina Institute (see Appendix A).

4.4.1 Economy accounts

The economy and livelihood accounts track current economic conditions of well-being, including GDP and all its components—personal consumption expenditures, government expenditures, business investment, and imports and exports. The GDP accounts are important for tracking the overall state of the economy—that is, the sum of goods and services traded in an economy or geographic region. The GPI accounts use expenditure-based and income-based GDP data from the provincial income accounts maintained by Statistics Canada and the Alberta Government. These data provide information on key indicators in the GPI accounts, including real GDP per capita, trade balance, government expenditures and public infrastructure values. All economic account data are expressed in monetary terms.

Government or public expenditures are also considered in the GPI accounts. These expenditures by federal, provincial and municipal governments contribute to the well-being of individuals, households and communities at the provincial and national level. In the case of the Alberta GPI accounts, the focus is provincial government expenditures and their respective contribution to the well-being of Alberta households. Public sector expenditures include health, education, social security and welfare, justice and safety, resource management and environmental protection, community development (culture and recreation capital outlays for infrastructure, recurrent maintenance expenditures and general government services.

Some government expenditures make a net contribution to provincial and national well-being while others serve to mitigate damages to human, social and natural capital that may have resulted because of economic development activity. Expenditures that presumably contribute to overall well-being might include most aspects of health and education programs. But should all aspects of health spending be considered as a positive contribution to well-being? Are some expenditures defensive in nature; that is, necessary because of the regrettable impacts of lifestyle choices and environmental pollution? Defensive expenditures also include spending on maintaining public order and safety, the military and social security.

The GPI accounts distinguish between government expenditures that represent genuine improvements in societal well-being and those that are defensive in nature, by including the former and leaving out the latter.

How do we decide which expenditures improve or maintain well-being and which are defensive? The answer depends on the values of society toward issues of governance, public services and taxation. Each society has a different perspective, which means that GPI accounts will vary according to community values. Notwithstanding the complexities of the issue, the importance of making such distinctions is critical in a discussion of the benefits of government expenditures of taxpayer dollars.

Determining which government expenditures belong to each category is tricky and would require a vigorous debate. How much of health spending, for example, is discretionary and how much simply offsets the impacts of regrettable activities in the economy, workplace or at the level of individual lifestyles? For the Alberta GPI accounts we arbitrarily assumed that roughly 50 percent of provincial government expenditures are defensive in nature.

The U.S. GPI calculations (Anielski 1999) do not even consider the issue of government expenditures. The Australian GPI (Hamilton 2000) treats most expenditure on public education as an investment in human capital but only 50 percent of health spending (as consumption) is regarded that way, with the other 50 percent assumed to be defensive. Australia considers spending on *recreation and culture* as wholly consumptive and wholly non-defensive and is therefore fully included in the GPI. The Australians also consider the merits of *general government services* (expenditures that cover general administrative costs of government, including basic functions such as tax collection and policy advice) as essential for good government. They arbitrarily assume that only 50 percent of general government services makes a positive contribution to welfare rather than simply off-setting falling conditions.

We believe that our assumption to regard 50 percent of government expenditures as "defensive" and 50 percent as a genuine contribution to well-being is reasonable for the Alberta GPI. We obviously recommend a thorough debate on the subject.

The issue of discerning the utility of government spending raises another important issue, that of assessing the "returns" (or outcomes of government services) from each tax dollar invested by citizens and business to operate a good, sustainable and civil society. The GPI accounting system would give decision makers the right set of lenses to examine government expenditures from this perspective. Linking budgets to government service outcomes is an important dimension of effective government strategic and business planning, and is something Alberta has pioneered. We think GPI accounting is an attractive tool for improving the existing business planning process of the Alberta Government, allowing decision makers to determine the long-term outcomes, impacts and utility of government services in relationship to investment of tax dollars.

4.4.2 Livelihood accounts

The economic livelihood accounts divulge important trends in the capacity of households to finance consumption and improve their well-being. Tracking changes in real disposable income, in relation to personal consumption spending, taxation and debt servicing costs, gives an important and pragmatic insight into the genuine economic well-being of citizens.

The importance of this perspective was particularly poignant in the case of the Alberta GPI accounts. In Alberta, GDP rose steadily throughout the 1980s and 1990s, but real disposable incomes remained stagnant, taxes increased, and household debt servicing costs soared. The Alberta accounts also revealed important trends in the way households are spending their after-tax disposable income. How individuals and households choose to allocate their income is an important indicator of their fiscal capacity and their overall well-being. For example, the fact that households are spending significantly more on recreation, entertainment and eating out than they did in the 1960s suggests a more affluent society and improved well-being. At the same time, rising levels of personal or household debt, with rising debt servicing costs, suggests that some households are constrained and worse off than in the 1960s.

4.4.3 Infrastructure accounts (public and household infrastructure)

The GPI accounts include an accounting of the service value and depreciation of public and household infrastructure, including consumer durables. Public infrastructure provides a stream of benefits to citizens, including roads, water systems, hospitals, and sewage and other management systems to deal with waste. GPI accounts measure the value of these services to households and businesses and place a monetary amount on them.

The GDP records the purchase of a car, dishwasher or refrigerator as a pure cash transaction without regard to the service derived from the durable item. According to the GDP, the more we spend to acquire, maintain and dispose of such durables, the more our economic well-being is assumed to increase. But what is most important to household well-being is a sustained flow of services from the durables and infrastructure we have purchased or built. In reality, the longer their lifespan, the more value households derive from them. Purchasing durables that wear out prematurely because of cheap materials or faulty manufacturing goes against common sense. Ironically, a society that constructs long-lasting infrastructure, both for household and public use, would have a lower GDP than a throw-away society.

Economists have long agreed that a more appropriate measure is the flow of services from the stock of capital rather than expenditures on capital. In other words, it is more meaningful to use an accrual basis than a cash basis. There is no agreement, however, on precisely how the stock should be measured or on how the value of the flow of services should be treated.

To predict consumer behaviour during various phases of the business cycle, a refined treatment of the issue is important. For the purposes of the GPI, which is primarily oriented toward long-term trends rather than short-term changes in the economy, a rough estimate of the flow of services from consumer durables is sufficient. GPI accounting rectifies some of the current shortcomings of GDP accounting by attempting to measure the value of services from the stock of buildings, roads, hospitals, water treatment facilities, homes, farm structures and many other forms of public and private infrastructure.

GPI accounting focuses on the value of service flows rather than expenditures on durables, reflecting the reality that, dollar for dollar, products that wear out quickly render less value than those that last longer.

In the case of household infrastructure and durables, GPI accounting focuses on the value of service flows rather than on the expenditures on the durables. This gets us closer to a genuine accounting of sustained built capital service. For the Alberta GPI accounts we estimated the service value of household infrastructure on the basis of 22.5 percent of the estimated stock value of household infrastructure from Statistics Canada's national balance sheet information. This is consistent with the U.S. GPI methodology (Anielski 1999). The logic applied in the U.S. GPI methodology dealing with consumer durables, is that if a product lasts eight years, it depreciates at 12.5 percent per year and thus provides that portion of its service each year. At the same time, if the interest rate is five percent, the purchaser of the product could have gotten that much interest by putting the money into the bank instead. Economists therefore regard the interest rate as part of the monetary value of the product to the consumer. Based on an assumed depreciation rate of 15 percent and an average interest rate of 7.5 percent, the value of services provided by consumer durables is estimated to be 22.5 percent of the net stock of cars, appliances, and furniture at the end of each year. To balance the estimated value of services from consumer durables, GPI accounts also subtract the actual expenditures on consumer durables to avoid double counting.

Focusing on the annual service that equipment provides rather than on the purchase price, corrects the approach taken by the GDP—that is, treating money spent as if it were the same as value received. The GPI approach reflects the reality that, dollar for dollar, products that wear out quickly render less value than those that last longer. Indeed, some corporations such as Interface Inc. (one of the world's largest interior carpet manufacturers) are moving in this direction. Under the leadership of Ray Anderson, the company has begun to shift its focus from regarding its product (carpet) as the end-point in the consumption process to a focus of sustaining services from the carpet for the long-term benefit of consumers. This shift requires a new philosophy, new manufacturing processes and new business arrangements, all of which provide exciting opportunities to move to a sustainable future where the focus is on resource and material efficiency, reduced toxic material inputs and throughputs, and building meaningful and long-term relationships between producers and consumers of durable items.

Ideally, an accounting of the physical condition of built capital is desirable, although such accounting is challenging. How do we measure the usefulness of a computer, refrigerator or automobile and how can we determine whether such items can deliver a sustained stream of service benefits or whether poor design renders them prematurely obsolete? Fair and accurate assessments are complex. The desired approach is to assess the full life cycle and utility of consumer durables and public infrastructure from a material and energy accounting framework; that is, to estimate the full costs and benefits, as well as associated impacts.

There are effectively two forms of public capital: 1) public infrastructure owned and maintained by government free of charge to citizens, and 2) public capital stocks owned by public trading enterprises (e.g., public utilities) that sell goods or services to consumers, such as electricity, gas, water and publicly-owned housing. In the second category, the services provided by the capital are already captured in the national accounts in consumption spending, either directly in final consumption or indirectly to the extent that these items are purchased by firms as intermediate inputs (Hamilton 2000).

Historically, public accounting conventions treated public infrastructure as effectively free because investments in built infrastructure were written off at a nominal one dollar on the public accounts. This practice violates generally accepting accounting principles applied to business where a capital asset account is maintained, showing the book value and allowing for depreciation cost of capital (a proxy for wear and tear) to be deducted against current income. Not so in public accounting for public assets. Fortunately, efforts are being made by public accountants, particularly by the Alberta Government, to rectify these shortcomings by establishing built capital accounts based on book value or replacement value of public infrastructure, as well as estimates of their depreciation value. GPI accounting concurs with this approach to holistically accounting for the value, depreciation costs and utility of public infrastructure, which is important for effective civic planning and governance.

In the Alberta GPI accounts for public infrastructure, we accounted for the total net capital stock value and estimated an annual value for services from Alberta Government-owned infrastructure based on Statistics Canada data. We estimated the value of services provided by roads, bridges, utilities and buildings in Alberta at seven percent of the capital stock value of the province's public infrastructure.[14]

To make such a calculation, we need to know how much infrastructure services contribute to regional or national well-being each year. We must also know something about the lifespan of public infrastructure components. If, for example, a road has a 50-year lifespan, then applying a straight-line depreciation function would yield an estimated annual service value

contribution of two percent of the capital cost value of the road each year. In the U.S. GPI, Cobb, Halstead and Rowe (1995) argue that we should also include the opportunity cost of funds tied up in public infrastructure or fixed assets and apply an interest rate of 7.5 percent. If an interest rate of four to five percent is closer to the real cost of capital for government, this would mean that the community receives annual benefits of roughly 7 percent of the freely provided stock of public capital. This is the basis for our calculation of the Alberta GPI accounts.

Public infrastructure must also be maintained and serviced. If maintenance and refurbishment investments fall behind, then future generations will face higher costs than current generations. The GPI accounts can show the relative value of annual services from public infrastructure on a per capita basis. If such service values are maintained or sustained, given a current desired stock of infrastructure, then sustainability of service flows is ensured. However, if such service values begin to decline in real terms (adjusted for inflation), this would be notice to consider increasing investments in capital maintenance.

In the actual GPI income statement, an adjustment is made to personal consumption expenditures for public and household infrastructure and durables for their service value and their depreciation cost. First, we estimated the value of infrastructure and added it to personal consumption expenditures to reflect the benefits individuals and households get from built capital services. Second, we deducted estimates of the depreciation costs (a proxy for the wear and tear on infrastructure over time) against personal consumption expenditures. These two adjustments to the GPI income statement may in some cases cancel each other out.

4.4.4 Transportation and trade

Transportation is a crucial factor in our trade-oriented economy. It is hard to imagine modern economies without the movement of goods and services by car, truck, rail, air, pipelines and electronic media. Transportation keeps our modern economies going, it maintains so-called competitive advantages and it enables the export of natural and human capital for improved economic well-being. But we rarely ask whether all this movement is necessary or sustainable for well-being at a personal or household level. For example, is the production and transport of our natural capital to foreign markets truly sustainable? Exactly what is our comparative advantage in terms of living capital and are we practising the principles of comparative advantage trade theory or simply engaging in a kind of competitive economic warfare trying to outdo our neighbours with a flurry of capital and monetary flows?

Tracking the movement of living and produced capital from producer to consumer and its value to households is a critical issue for GPI accounting. In our initial efforts to construct the Alberta GPI accounts we have only begun to develop a full transportation and trade account. To develop a transportation account, we must understand:

- natural capital stocks and flows (trade);
- human capital stocks and flows (professional services of intellectual capital);
- information capital stocks and flows (data and knowledge); and
- the actual volume of activity occurring by each mode of transportation.

Transportation accounts are also linked to other GPI accounts, including energy, air quality, carbon budget, water quality, ecological footprint, and auto crashes. Assessing the full costs and benefits of various forms of transportation is important, including estimates of the Ecological Footprint (the amount of resources used) and life-cycle analysis for various forms of transportation and trade activity.

Our study into this issue is preliminary. An examination of transportation expenditures for Albertans shows an average 166 percent real increase in transportation-related spending between 1961 and 1999. Transportation is now the second most important expenditure item for Alberta households after housing. As fuel costs have increased, transportation costs will become even more significant, adding to GDP growth but also adding to the total costs of living (which also adds to GDP growth).

Yet the full costs of transportation (e.g., health, environmental, social costs) are not accounted for in the GDP and national income accounts. GPI Atlantic and Statistics Canada are working to develop a GPI transportation accounting methodology and we await the outcome of this work to guide future GPI accounting.

Conceptually, there are many aspects to a transportation account:

- the full costs of transportation (automobiles, truck-transport, rail, air, pipelines, electronic) to human health, climate change and social cohesion;
- the cost of automobile accidents;
- commuting time and the cost of commuting;
- the full costs and benefits of public transit;
- the full costs and benefits of air travel; and
- the full costs and benefits of commercial transportation.

For the Alberta GPI accounts, we focused only on commuting time, looking at both actual time spent commuting and the costs of commuting (direct expenditures incurred in traveling to and from work). This restriction was due to the lack of resources and time to complete a more complete transportation account. We challenge other researchers to fill this gap.

We did not complete a public transit account nor did we account for the full costs and benefits of commercial transport or air travel. Other studies do assess these full impacts, including the work of GPI Atlantic[15] in assessing transportation impacts. The GPI Atlantic study expects to consider three separate components related to transportation in their Genuine Progress Index:

- the services of roads and highways (positive investment);
- the costs of commuting (intermediate expenditure); and
- the costs of automobile accidents (reduction of welfare).

These accounts will also be linked to the climate change and air pollution cost indicators.

4.4.5 Time-use accounts

Our time is the ultimate unit of currency and our most precious resource. Every day we choose how to allocate our 24 hours, whether working, playing with the kids, cooking, walking, golfing, or sleeping. The GPI accounts consider the time use of individuals and households as the foundation of well-being accounting. Time use accounts attempt to comprehensively assess how individuals and households use their time over the course of each day and for a full year. Because time-use accounting is such good common sense, it is surprising that economists and others have not regarded this approach as fundamental to understanding the genuine well-being of individuals and households.

Time-use accounts can be developed from Statistics Canada's time-use surveys, three of which have been conducted since 1986. Canada is one of the few countries in the world to undertake this work, and New Zealand and others are now following suit. Based on detailed household surveys in which individuals are asked to maintain a time-use diary, the Statistics Canada survey gives us a rich account of how our energy is allocated day by day. Time-use accounts can tell us whether households are time-stressed. Are two parents working more in 1999 compared with 1970? Are we spending more or less quality time with our families? How much are we multi-tasking? How much time are we spending in quiet reflection or at leisure activities? How much time are we devoting to the community as volunteers? Are we getting enough sleep? In short, what are the trends in how we use our time?

Our time is the ultimate unit of currency and our most precious resource. Of particular importance in time-use accounting is sensitivity to the variance in time use by age, sex, and socioeconomic status.

Most would agree that answers to these questions are critical to understanding the condition of our well-being. So why do economists spend more effort monitoring individual and household expenditures on material goods and services? For more than 50 years we have been tracking household personal consumption expenditures, which are the bulk of the GDP figures. Why haven't we spent the same 50 years tracking time use? Indeed, we might expect there to be a great deal of interest and voluntary input into time-use accounting at the community level without the prompting of census surveys by Statistics Canada. GPI accounting would make time-use accounting a common practice—just as common as the census and personal consumption surveys. People would contribute simply because they are curious about how their lives are going. We believe that adopting an ongoing practice of time-use accounting could be practical and fun, yielding a rich source of practical information of use to politicians, planners, social workers, health care workers, community groups and individual households.

In addition to maintaining a time-use account, the GPI accounts provide a systematic approach to valuing this time use according to market values or replacement values, particularly for time spent outside the paid labour market. The SNA and GDP ignore the value of unpaid work such as housework, parenting, eldercare or volunteerism. In the eyes of those who calculate the GDP, the value of this important work counts for nothing.

GPI accounting corrects this myopia. Unpaid time can be assigned a proxy value based on an analysis of how much it would cost to buy the services in the marketplace. The criterion is simply what you would have to pay someone else to perform the function on your behalf. Several possible approaches can be used to assign a monetary value to unpaid work. One is the actual replacement value for a worker who could perform the service that you, government or a business has chosen not to provide. The second approach is to apply an average wage rate to the unpaid work time. A third approach is to attach your average wage rate to the time you spend at unpaid work in the household or community.

For the Alberta GPI accounts we used the first approach. This estimated value of unpaid housework, parenting, eldercare and volunteerism is added to personal consumption expenditures in the GPI income statement to reflect a proxy market value for the economic utility of such otherwise unaccounted benefits to well-being.

We have treated the value of time devoted to these activities as a positive (benefit) in the GPI and the value of time engaged in involuntary activities (which includes commuting time and overwork) as a negative. Debates over what constitutes an involuntary activity or regrettable use of time will occur particularly in the case of time spent commuting. We all have different value sets and will assign different weights to the way we spend our time. For example, for some an increase in time spent commuting may be a "cost" while to others it may be a "benefit." We assume that the following voluntary activities contribute to our welfare:

- Paid work (except the involuntary component referred to below as "overwork");
- Household work;
- Parenting and eldercare;
- Volunteerism or community work; and
- Leisure activities.

The following activities are assumed to diminish welfare, imposing a "cost" on individuals, households and the community:

- Involuntary leisure; i.e., the times when we are unemployed but want to be employed;
- Involuntary work; i.e., the times when we are doing paid work but would prefer not to be; and
- Involuntary commuting time; i.e., the time required to travel between home and work.

Of particular importance in time-use accounting is sensitivity to the variance in time use by age, sex, and socioeconomic status. Using average time-use profiles of society may mask time-use concerns that are unique to a certain cohort of individuals or households in society. For example, an average time-use profile might be made up of some individuals who are overworked while others are underemployed or may be semi-retired from the labour force. Our GPI accounts have generally used average household time-use profiles drawn from Statistics Canada surveys for Alberta. However, the time-use accounts are robust enough to show the distribution of time use by age and socioeconomic profile.

The condition of paid work: Complementing the time-use accounts are accounts of the nature of employment including the extent of full employment, overwork and involuntary underemployment. Such an account is critical to assessing the paid working conditions of citizens and households. Are people overworked and time-stressed? How close are we to full and meaningful employment?

Leisure time: Like the U.S. GPI we also consider the loss of leisure time as a cost to welfare and an increase in leisure as a benefit. The Australian GPI (Hamilton 2000) departs from this approach as do the U.K. and Swedish ISEWs (Jackson *et al.* 1997; Jackson and Stymne 1996). Cobb, Halstead and Rowe (1995) justified their inclusion of loss of leisure time in the U.S. GPI by arguing that working hours in the U.S. have been getting longer and that this represents an involuntary loss of leisure. To measure this cost they deducted from the GPI the value of the leisure hours lost relative to leisure enjoyed in 1969, the year of greatest leisure since 1950. We have adopted a similar approach in the Alberta GPI accounts. The Australian GPI (Hamilton 2000) does not include an estimate of the value of lost leisure time but instead estimates the costs of overwork.

4.4.6 Social capital accounts

The social capital accounts of the GPI accounting system are broadly defined as the conditions of well-being at the community level that reflect a civil and just society. The nature of social cohesion and the health of a community are the focus of this component of the GPI accounts. A strong and cohesive community, state or nation is characterized by healthy political, legal and other institutional structures. Community cohesiveness results from an open, inclusive, trusting and caring society. Economic well-being is also enhanced when such social capital is healthy. While difficult to define and measure precisely (particularly in monetary terms), social capital proxies do exist and are included in the GPI physical and qualitative accounting framework and, in some cases, in the monetary accounts.

Many determinants of societal or community well-being involve the interrelationships of individuals and households living together in community. Proxies for the health and well-being of a community include crime, poverty, single-parent households, family breakdown, income (and wealth) inequality, and democracy. We have used some of these proxies in constructing GPI accounts and many were estimated for the Alberta GPI accounts, but the list is by no means complete. The GPI architecture allows for expansion of the accounts depending on the needs of a community in assessing its well-being.

The indicators of societal well-being that we examined in the GPI Alberta accounts are largely objective measures using longitudinal traditional data such as crime rates, divorce and poverty rates. But it is also valuable to assess the more subjective, intangibles that contribute to quality of life. Although it is difficult to concretely gauge the "feeling" of community, personal safety and cohesion that people experience in their neighbourhoods, such a "taking of the pulse" is an important complement to the traditional proxies. Indeed, the traditional measures could be the starting point for engaging communities in a dialogue about what is important to defining their well-being where they live. The objective evidence of their societal conditions compared with the conditions in other communities can lead to an informed discussion about how to improve well-being or sustain quality of life over time.

The GPI accounts for social capital are quantitative and, in some cases, monetary in nature. Physical accounting of social capital includes such measures as crime rates, divorce rates, poverty, voter participation and income inequality. Full cost accounting of social health includes the following items, with some examples provided:

- cost of crime (costs of policing, prison operations, courts, locks and security systems);
- cost of family breakdown (the cost of divorce lawyers, counseling, courts, and establishing two new households where one previously existed);
- costs of gambling (cost associated with problem gambling);
- costs of unemployment and underemployment;
- costs of auto crashes (the direct costs of auto crashes including automobile repairs and insurance costs, plus indirect costs of the time value of lost work due to injury); and
- costs of suicide (direct medical and other costs, plus indirect societal costs in terms of lost productivity).

Some of these costs are also human health related and making a clear distinction is a challenge.

4.4.7 Human capital: health and wellness, and intellectual capital accounts

Health and wellness: The condition of our body, mind and spirit is perhaps the most defining feature of what we call human capital. In part, our physical and mental condition defines our condition of well-being. Assessing and measuring health and wellness is complex and challenging given the many determinants, some of which are subjective and intangible. Ideally, we would like to measure the condition of body, mind and spirit, as well as the capacity of individuals to cope with the conditions of living. This capacity ultimately defines peoples' outward behaviour in a family unit or in the community, and understanding how they deal with life's challenges is key to understanding the many outcome measures we use to assess the overall well-being of a household, community or society.

Measuring the conditions and determinants of human health and wellness involves a complex array of socioeconomic, diet and environmental factors. We have relied on traditional measures of human health and wellness in establishing the GPI accounting framework and we welcome further analysis that will lead to more complete and holistic GPI accounting systems. The GPI accounts developed for Alberta provide a preliminary sketch of how human health and wellness accounts might be structured and how proxies for human health could be compared and correlated with economic, social and environmental indicators.

Our initial list of health and wellness indicators includes life expectancy, infant mortality, disease and premature mortality, obesity, suicide, auto crashes, problem gambling and substance abuse. We realize a more holistic framework is needed as some of the social capital indicators may also influence human health. This segment of the GPI accounts represents one of the most exciting areas for research and development and we hope others familiar with the full range of factors that determine health and wellness will further develop this work.

The GPI accounts include estimates of human health and wellness costs for the following:

- cost of substance abuse (drugs, alcohol) based on Alberta Alcohol and Drug Addictions Commission estimates of the economic and social costs of illicit drug use (health care, crime-related, and financial costs);
- cost of auto crashes (the direct costs of auto crashes including automobile repairs and insurance costs, plus indirect costs of the time value of loss of work due to injury); and
- cost of suicide (direct medical and other costs, plus indirect societal costs of lost productivity).

Some of these are also identified as social costs. There are many opportunities to research the full costs and benefits of human health-related GPI parameters, including the full and long-term costs of obesity and poor diet.

Intellectual capital: Our knowledge and skills are increasingly important assets to the well-being of our economy and society. Intellectual capital is broadly defined as individuals' knowledge, skills and capacity to reason in a community. This includes the level of education, training and knowledge gained by a population engaged in economic activity. It may also include measures of literacy and numeracy as well as the capacity of individuals for problem solving. Increasing attention is being devoted to measuring intellectual capital as economies become more service oriented and less natural capital intensive.

The GPI accounts attempt to measure intellectual capital in terms of the educational attainment of citizens (the percentage of the population with post-secondary education). We

recognize that intellectual capital is more complex than this one proxy; however, given the availability of educational attainment data both historically and interprovincially it serves as a useful starting point. Further research and development of intellectual capital accounting is desirable—accounts that might include competencies, skills and knowledge of individuals, businesses, a community or society. The skills of individuals and households contribute to social capital and community well-being.

The Alberta GPI accounts consider educational attainment as a proxy for the intellectual capacity of society. We can then compare educational attainment with average real incomes to assess returns on intellectual capital accomplishment. This gives decision makers important insights into whether we are making meaningful progress in building intellectual capacity and realizing the market returns for such investment. Such accounts could also be used to track the supply of intellectual capital (competencies, skills, knowledge) being developed within various disciplines compared with the demand for such intellectual capital. We could then begin to better assess our intellectual capital needs for a sustainable future, using such information in educational planning.

4.4.8 Natural capital and ecosystem service accounts

Natural capital and ecosystem services are essential to sustain human well-being. This living capital comprises ecosystems that provide, among other things, two indispensable benefits to humans:

- natural resources to meet material needs, and
- ecological services such as clean air and clean water.

While physical stocks and flows of natural capital may be observed and quantified, measuring ecosystem services and ecological integrity, and determining carrying capacity and thresholds is more challenging.

The theory of natural capital accounting is rooted in the principles of economics, ecology, and accounting. Natural resource accounting is based on the premise that the accounting principles applied to human-made capital assets should also be applied to natural capital by accounting for its monetary value and its physical condition (that is, its stock, flow and quality). Clear distinctions must be made between accounting for renewable and non-renewable natural capital. In theory, renewable resource use can be sustained in perpetuity as long as the natural system remains able to provide a continuous stream of goods and services without compromising ecosystem integrity. Non-renewable resources are, by definition, finite and their stock and annual depletion rates become important indicators of the life of reserves remaining for human use. With more complex issues such as ecosystem integrity, proxies for the sustained flow of services provided by the environment (e.g., air and water quality, carbon sequestration) will become key indicators of sustainability and carrying capacity.

Clear distinctions must be made in accounting for renewable and non-renewable natural capital. Defining the sustainability thresholds of natural capital is the greatest challenge in resource accounting.

Current national income accounting practices and the System of National Accounts, from which economic performance measures like the GDP are derived, fail to account for either the inventory of natural capital or its monetary value expressed in terms of its depreciation. This violates basic capital accounting practices as they are applied to produced capital, such

as buildings and equipment. Natural resource and environmental accounts are intended to rectify this shortcoming by creating either (a) a parallel set of satellite accounts, or (b) fully integrated accounts of the physical and monetary state of natural capital assets.

Sustainable resource use means *living off of the interest on nature's capital* without compromising the productive capacity of the natural capital stock. Defining the sustainability thresholds of natural capital is the greatest challenge in resource accounting. At the very least, natural resource accounts can give us a "mirror" that reflects the current status of nature's capital, allowing decision makers to assess whether we are living beyond nature's sustainable income benefits, eroding natural capital stocks and degrading ecosystem services (e.g., depleting timber capital at a rate that exceeds annual growth).

The architecture of the Alberta GPI natural resource and environmental indicator accounts follows the Statistics Canada capital model. The accounts are also consistent with the natural capital accounting frameworks developed by the United Nations and Statistics Canada. The Alberta natural capital accounts constitute one of the first complete sets of natural resource and environmental accounts ever completed, using publicly available resource information from Statistics Canada, the Alberta Government and other sources.

Statistics Canada's *Econnections* (1997) natural wealth accounting system and the United Nations (2000) *Integrated Environmental and Economic Accounting, An Operational Manual* form the blueprint from which the Alberta GPI environmental accounts were developed. Recent recommendations by the U.S. National Research Council in *Nature's Numbers* (1999) also provided important guidance. The GPI natural capital and environmental accounts represent the continued development of earlier Alberta natural capital accounts.

The GPI accounts (as applied to Alberta) for natural capital and ecosystem services include:

- Forests (timber capital);
- Carbon sequestration by forests and peatlands;
- Non-renewable energy resource (oil, gas, gas byproducts and coal);
- Agricultural soil erosion;
- Renewable energy resource capacity analysis;
- Agricultural land and sustainable agriculture practices;
- Carbon budgeting;
- Greenhouse gas emissions;
- Air quality;
- Water quality and volume;
- Toxic waste;
- Municipal landfill waste and recycling;
- Species diversity, effective habitat and habitat fragmentation;
- Ecological integrity and ecosystem fragmentation (based on forest fragmentation); and
- Ecological footprint analysis.

Each Alberta natural capital and environment account consists of physical and monetary accounts of natural resources and environmental services. The physical accounts are an inventory of all natural capital assets expressed in physical quantities or qualitative proxies. They express the physical availability (the stock) and annual flow (depletions and additions) of the inventory of natural capital. The environmental accounts also indicate the condition or

quality of the environment—air, water and soil, and ecosystem integrity—expressed in units that are commonly used to measure environmental quality and flows of ecosystem services. The physical accounts are structured to be consistent with Statistics Canada's System of Environmental and Resource Accounts (1997a).

The physical accounts provide the foundation on which sustainability of natural capital can be evaluated and from which most sustainability indicators for the Alberta GPI sustainability accounting system were derived. The Alberta GPI resource and environmental accounts go beyond the current Statistics Canada resource accounts by looking at areas such as carbon budgets, ecological footprint analysis and ecosystem integrity measurement. As well, the Alberta accounts explore issues such as the distribution of forest species age-class structure and the status of old-growth forests. We also tried to construct groundwater and surface water stock, flow and quality accounts, which have not yet been completed for Canada. Although we attempted a full analysis of natural capital stocks, flows and qualitative conditions, we recognize that a full physical accounting for sustainability is a work in progress.

The physical resource accounts are complemented by the monetary accounts that address both the market value of natural capital assets and ecological services. In the Alberta GPI accounts, we focused on a valuation of natural resource assets that have revealed market values involving transactions of money in a trading environment. Some non-market costs were estimated, including liability cost of toxic and landfill waste, loss of wetlands services and shadow price for greenhouse gas emissions. However, most natural capital assets do not have observed market values; among these are, ecosystem services, watersheds and wildlife.

The Alberta GPI monetary accounts for natural capital include:

- non-renewable resources (oil, natural gas, gas byproducts and coal);
- renewable resources (timber);
- agricultural land (based on commodities); and
- carbon sequestration values by ecosystems.

The oil and gas and timber capital accounts were constructed using economic rent estimates by Statistics Canada. Other natural capital assets were valued using other revealed market and non-market values from various sources.

Economic rent calculations represent an indirect estimation of market value by taking the difference between the revenue generated from selling natural resources and all costs incurred in the extraction of the resources, including the cost of produced capital, but excluding taxes, royalties and other costs not directly related to extraction. Given that governments are the primary owners of natural resources in Canada, governments theoretically would attempt to capture the entire economic rent through royalties, fees and taxes as their fair return to natural capital. In theory, we could equate the royalties and taxes collected by governments respecting natural capital extraction as a proxy for economic rent. However, governments do not necessarily capture 100 percent of available rents, necessitating the more difficult task of imputing of resource rents by piecing together available market and production cost data.

We also provide rough estimates of the cost of pollution and environmental degradation, which are used in the GPI net sustainable income statement; these include:

- the depreciation cost of non-renewable resource use;
- the cost of erosion of bare soil on cultivated land;

- the cost of unsustainable timber resource use in terms of the loss in value of future pulp production;
- the cost of non-timber forest values due to reduction in productive forest land;
- the cost of reduction in yields due to salinity on dryland and irrigated cropland;
- the cost of air pollution;
- the cost of greenhouse gas emissions (damage costs related to climate change);
- the cost of loss of wetlands;
- environmental costs of human wastewater pollution;
- non-market cost of toxic waste liabilities; and
- non-market cost of municipal waste landfills.

We cannot stress enough the complexity and challenges of constructing a large and integrated data set that considers both the physical condition and monetary values of natural capital. Measurement of natural capital is not straightforward despite years of resource inventory efforts by both provincial and federal governments. Indeed, as our experience with constructing the forest accounts for Alberta showed, despite 40 years of timber inventories (four separate Alberta inventories) we still lack a satisfactory account of timber sustainability over time. Rather we must often resort to choosing a single inventory as the starting point of our analysis then make assumptions about "back casting" the accounts through time using the best available information on extraction and additions to the stock of natural capital.

Most of the GPI accounts are independent, stand-alone accounts; however, many are linked or integrated with each other to reflect the complex interrelationships that exist in natural systems. The spreadsheets contain the physical and qualitative data time series as well as the monetary values, either as economic rent values attached to the physical stock and flow accounts, or as monetary cost or benefit estimates.

There are probably as many opinions on the right suite of indicators of sustainable development and sustainability as there are on the meaning of the term itself, and there is no right or wrong set of sustainable development indicators. Drawing from data contained in the natural resource and environmental accounts, we used the indicators shown below in Table 10 for reporting on sustainability.

Table 10: Alberta GPI Natural Resource and Environmental Accounts

Alberta GPI Natural Resource and Environmental Accounts	Sustainability Indicators	Monetary Values
Forests	• Timber sustainability index (ratio of annual growth to annual of total depletions) • Age-class distribution of forests (percentage of forest remaining that are "old-growth") • Carbon sequestration rate of forest ecosystems • Employment per dollar of forestry GDP • Forestry GDP per cubic metres of trees harvested	Cost of unsustainable timber resource use (loss in pulp production value) Cost of non-timber forest values due to change in productive forest
Agriculture	Agriculture Sustainability Index, a composite of the following parameters: a) Crop yields b) Soil erosion c) Salinity d) Pesticide/Herbicide use e) Irrigation f) Farm debt Also included are measures of organic agricultural land use and organic soil carbon (see carbon accounts)	Cost of erosion on bare soil on cultivated land (on-site and off-site) Cost of reduction in yields due to salinity on dryland and irrigated cropland
Non-renewable resources (oil, natural gas, gas by-products and coal)	• Conventional crude oil reserve life • Natural gas reserve life • Synthetic/Bitumen crude oil (from oilsands) reserve life • Coal reserve life (sub bituminous, bituminous)	Depreciation costs (economic rent value) of depletion of oil, gas and coal reserves (inventories)
Energy use intensity	• Energy use (gigajoules) per GDP and per capita • Greenhouse gas emissions per GDP	
Carbon budget	• Ratio of carbon dioxide emissions (all sources) to annual sequestration by forests, peatlands and agricultural soils.	Estimated global environmental and health liability cost of carbon emissions.
Ecosystem integrity	• Forest fragmentation index (percentage of forest ecosystems that have a given degree of linear disturbance and industrial development) • Percentage of land and water that has been designated as parks, wilderness, "special places" or other designation.	
Biodiversity (fish and wildlife)	• Population levels of fish and wildlife species • Endangered species list	

Alberta GPI Natural Resource and Environmental Accounts	**Sustainability Indicators**	**Monetary Values**
Wetlands	• Area of wetlands remaining of original (pre-settlement) area	Cost of loss of wetlands and peatlands
Peatland	• Area of peatland • Peatland volume harvested (historical) • Carbon content of peatland	
Water quality	Water quality composite index including: a) pulp effluent b) percentage of municipal population with tertiary sewage treatment; c) *Giardia* and *Cryptosporidium* cases d) long-term monitoring of dissolved oxygen, nitrogen, phosphorous and fecal coliforms along five major Alberta rivers.)	Environmental cost of human wastewater pollution
Air quality and emissions	• Increased risk of death for Edmonton and Calgary residents attributed to city-specific air pollutants. • Change in air pollution concentrations of carbon monoxide, nitrogen dioxide, sulphur dioxide and ozone	Cost of air pollution Cost of greenhouse gas emissions (damage of climate change)
Toxic (hazardous) waste	• Volume of toxic releases and storage • Volume of hazardous waste eliminated	Non-market cost of toxic waste liabilities
Landfill waste	• Volume of waste to landfills • Percentage of landfill waste recycled	Non-market cost of municipal waste landfills
Ecological footprint	Ecological footprint per capita (the amount of land, water and other resources required to meet the current consumption patterns of Albertans, also broken down by income group and major cities).	

The choice of sustainable development indicators depends on how one views the desired outcomes for natural capital stewardship, ecological integrity and the relationship of the environment and the economy. Aspects such as the substitution effect, technological influences, and eco-efficiency impacts on both stocks and flows of natural capital can be revealed with a robust set of natural capital and environmental accounts.

The natural capital and environmental service sustainability indicators chosen for the Alberta GPI accounts considered a number of Alberta, Canadian and international benchmarks. These included indicators used by the Alberta Government in *Measuring Up* (the annual performance report to Albertans) and Alberta Environment's performance indicators. We also considered the set of sustainable development indicators proposed (but never implemented) by Alberta's former Round Table on Environment and Economy.

We also examined international benchmarks of sustainability indicators for forests, biodiversity, non-renewable resources, water and other forms of natural capital; specifically, we looked at indicators developed by the World Resources Institute (WRI), the World Watch Institute (*Vital Signs)*, the World Bank (total wealth accounts), the OECD, the World Commission on Forests and Sustainable Development, and the U.S. President's Council of Sustainable Development. Canadian benchmarks included the forest sustainability indicators of the Canadian Council of Forest Ministers and those developed by Global Forest Watch (sponsored by WRI) for Canada's forests. In many cases, we consulted experts and in others cases simply used common sense as a guide.

After examining various benchmarks, we generally took an intuitive approach to choosing indicators. We wanted simple, elegant indicators of sustainability that would be understood by the public and be supported by sound, scientific data. Our indicators of natural and environmental capital sustainability took complex information and distilled it into a proxy aggregate measure of sustainability. Creating composite indices to represent complex systems like a forest or an acre of agricultural land is not easy and will be fraught with problems and controversy. Problems include indicator weighting bias and limitations inherent in the data. We acknowledge these limitations yet feel comfortable that the data supporting the indicators are transparent and readily accessible when you drill down below the indicator signal itself.

The open and transparent architecture of the Alberta GPI accounts enables more detailed examination of the raw data as well as continuous improvement of the information systems and indicators that are derived from the system.

In the end, an indicator is only as good as the data that support it. We recognize that condensing an array of complex information and data into one or more indicators to compare against economic indicators (like the GDP) is likely to be protested by those who are knowledgeable about the intricacy of these issues. The ultimate test is whether the indicators are reasonable proxies of the conditions of the environment they are attempting to measure and whether they are based on sound, scientifically valid data.

The strength of the Alberta GPI accounts is their open and transparent architecture, which allows for more detailed examination of the raw data as well as for continuous improvement of the information system and the indicators that are derived from the system. The indicators used in the Alberta accounts were also intended to provide a non-biased perspective.

Indicators of sustainability in the Alberta GPI environment accounts use raw data from roughly a 40-year inventory (with some exceptions) of trend data contained in the full set of natural capital and environmental accounts. Indicators were derived using either a blend of raw data sets to create a composite index (e.g., the timber sustainability index) or singular raw data (e.g., carbon dioxide emissions).

Each of the Alberta GPI natural resource and environmental accounts contains data from 1961 to 1999. In some cases, 40 years of data were not available so only known data were reported. In cases of data gaps between inventory years, we used regression analysis or other reasonable extrapolation methods to estimate missing data points. The more complex indicators used several data series. For example, the agricultural sustainability index was derived using five individual proxies of sustainability of agriculture: salinity, soil erosion, yields, summerfallow and organic agriculture. Assessing ecosystem integrity requires a far

more intricate accounting system, which we believe remains the greatest challenge for natural resource accounting. In the Alberta GPI accounts, we used the "estimated linear disturbance of forest ecosystems by industrial development" as a proxy for ecosystem integrity and effective habitat for wildlife. After a review of best practices and literature review, we recognized that indicators of ecosystem services and ecological integrity are only now emerging, as scientists begin to understand how to measure the impacts of human activity in these areas.

We used composite indices in cases where we knew no single proxy would be meaningful or acceptable to all stakeholders. In developing composite indices, our objectives were:

1) to provide a full and transparent account of all dimensions or conditions of the natural capital being accounted for, and
2) to derive reasonable proxies or indicators of sustainability that best reflect the principles of sustainable development.

We consulted with experts while developing the Alberta GPI accounts to receive critical feedback and direction, but we accept responsibility for the choice of raw data inventoried and for the choice of indicators used to measure sustainability. We also accept that consensus on sustainability indicators may require considerable further consultation and experimentation with the construction of comprehensive natural capital accounts.

4.4.9 Ecological Footprint Analysis

Ecological Footprint Analysis, developed by Wackernagel and Rees (1996) is a powerful new tool for evaluating the sustainability of lifestyles of individual citizens and for comparing nation states. Ecological Footprint Analysis (EFA) evaluates the amount of land, water and resources required to support current levels of consumption[16] by individuals and households. EFA that shows the current rate of resource consumption demands can be compared with estimates of the "carrying capacity"[‡] of the natural environment to sustain a constant flow of natural capital goods and services. The EF answers some fundamental questions related to personal and household sustainable living, such as:

- How much land, energy and resources (materials) are needed to meet our food, shelter, clothing, transportation and other living requirements?
- How large is our ecological footprint in relation to the natural carrying capacity of Canada or to Alberta's land base?
- How large is our footprint compared with that of other countries?
- What is the ecological deficit we impose on those in other nations from consuming beyond the carrying capacity of the planet?
- How does our trade in natural and human capital affect local and global sustainability, as measured by the EF?
- How have our household consumption patterns changed over time with respect to the amount of land and resources required to meet our demands for shelter, food, clothing and transportation?

The ecological footprint measures the extent to which the biosphere is overburdened by human activities, and keeping humanity's footprint within the planet's biological capacity is a minimum requirement for sustainability. Individuals can calculate their own ecological

[‡] Carrying capacity is the amount of arable land and resources available in a region for a given population.

footprint using the tools available on several websites including Mountain Equipment Co-op's site (www.mec.ca). Such information can inform and motivate individuals to reduce their demands on natural resources. Such analysis is relevant for measuring the sustainability of current lifestyles and consumption patterns and the potential ecological deficits being imposed on citizens of other nations and future generations of Albertans and Canadians.

EFA is also important to understanding the trade flow of natural capital goods and services in and out of regions. In principle, EFA should be able to reveal the degree of natural capital self-sufficiency of any given region in Canada as well as the degree of dependence on natural capital inputs (imports) to fulfill consumption demands. If EFA were combined with information contained in natural capital accounts that show the trade flows of natural capital assets to domestic and export markets and material and energy flow accounts,[§] a powerful set of tools would be available for assessing sustainability.

The ecological footprint measures the extent to which the biosphere is overburdened by human activities. Keeping humanity's footprint within the planet's biological capacity is a minimum requirement for sustainability.

EFA uses personal consumption expenditures on goods and services, drawn from the System of National Accounts, to estimate the amount of material requirements to fulfill such lifestyle choices. One of the criticisms of the EFA is that it is based on expenditure information rather than actual physical material flows of goods and services (e.g., litres of milk consumed and source of the milk). EFA would benefit from improving the methods for tracking the flow of material goods and services in an economy.

The Alberta GPI accounts contain estimates of the EF of Albertans from 1961 to 1999. The average Albertan's ecological footprint grew by 66 percent, increasing from 6.5 hectares per person in 1961 to 10.7 hectares per person in 1999, over five times the global ecological carrying capacity of 1.8 hectares per person. This gives Alberta the fourth largest ecological footprint in the world after the United Arab Emirates, Singapore and the United States. If the entire world had an ecological footprint as large as the average Albertan, five planets would be needed to meet consumption demands. The Alberta ecological footprint is 37 percent larger than the Canadian ecological footprint. Albertans in the top income quintile have an ecological footprint almost 50 percent larger than the provincial average and 200 percent larger than Albertans in the lowest income quintile.

Ecological footprint analysis gives policy makers and citizens information about the impacts of consumption behaviour on ecological integrity and sustainability. EFA complements the other indicators of the GPI Account indicators by providing a benchmark of sustainability to guide policy decisions and personal lifestyle choices in addressing Alberta's sustainable well-being from a global perspective.

If local gains in natural, economic, or social capital come at the expense of accelerating ecological damage and social disintegration elsewhere, then local prosperity comes with a cost to global sustainability. The ecological footprint examines the impact of our consumption—both locally in Alberta and globally—and provides a more complete picture of the consequences of our consumption habitats and demands.

[§] Material and energy flow accounts have been developed on an experimental basis by the World Resources Institute (2000) for the Netherlands, Japan, Austria, Germany and the U.S. and are under development by Statistics Canada.

If EF analysis and audits were incorporated into the public policy and budgeting processes, it could have profound implications on households, business and government. For example, trade and foreign policy could consider both interregional and transnational impacts of import and export policies that impose ecological deficits on other citizens and ecosystems, depleting natural and human capital in one region to feed consumption demands in Alberta or Canada. This would give a whole new perspective on the full impacts of globalization and free trade.

Footprint analysis empowers individuals to change their personal lifestyle choices to ensure a sustainable future for both Albertans and citizens of the global community. For example, Albertans' relatively large ecological footprint could be reduced by choosing to travel less, take public transit, walk or cycle to work, or buy local produce, goods and services. EFA provides an ecological reality check that can lead to a fundamental personal examination of "what can I do today to reduce my footprint?"

5.0 Strengths and Weaknesses of the GPI

Many people will welcome GPI well-being accounting as a refreshing alternative to years of measuring economic progress according to money measures such as the GDP. Others will find these alternative approaches a threat. We consider GPI accounting an opportunity to begin a new legacy for accounting for sustainability in the 21st Century.

Envisioning and developing a new accounting system to measure the sustainable well-being of nations is a bold and humbling undertaking. We expect and welcome critical debate in the spirit of moving beyond the current system of income accounts and GDP measures of economic progress. Our work goes well beyond the original U.S. ISEW and the GPI. John Cobb Jr., the key creator of the ISEW remarked upon reviewing our proposed GPI accounting framework:

> "I am amazed and delighted by the thoroughness and thoughtfulness of your work. It goes so far beyond what I even dared to envision when I first decided it was worthwhile to try to construct an indicator (the U.S. ISEW and GPI)."[17]

The Alberta GPI accounts are a first step toward an accounting system that would help all of us become genuinely sustainable stewards of living capital. This journey will require as many years of development and continuous improvement as did the development of GDP and national income accounting. The Pembina Institute is committed to this journey and to working with others to design a structure and practical tools for managing the sustained well-being of living capital—at the household, community, corporate and national level. The GPI represents holistic thinking and synthesis of the best models, tools, data and ideas. We believe the GPI accounting structure is intuitive and that it appeals to common sense. Our goal is continuous improvement of this first generation of GPI accounts and we welcome and encourage input from all stakeholders.

Since the April 2001 release of the first GPI accounts for Alberta,[**] the response has been largely favourable, as the results resonated with average Albertans and Canadians. We believe this is because the GPI accounts provide a holistic mirror that we can use to assess the true conditions of our economy, households, personal health, community health and environmental integrity now and retrospectively. The GPI accounts show that while economic progress has improved well-being in some areas, other areas have not fared so well.

Where criticism has come, it has focused on the issue of values as they relate to the selection, weighting and creation of composite GPI indices of well-being. This reaction is valid and was expected. If what we measure is what we value then the choice of indicators and the method of benchmarking good and poor conditions of well-being will colour the GPI portrait that emerges. There is no easy answer as to which indicators should or should not be part of a GPI account, nor are there prescriptions to indexing or solutions about the conditions that are revealed in these accounts. The intent of the GPI accounts was to develop a robust, organic and transparent architecture that would allow for improvement and modification over time.

There has been surprisingly little critique of the monetary GPI accounts. These accounts estimate the full costs and benefits associated with the consumption of living capital, which currently improperly counts as improved economic welfare as the GDP rises with "illth" (degradation of human, social and natural capital). A vigorous debate about the original GPI monetary accounts

[**] This report, entitled *Alberta Sustainability Trends 2000*, and two-page summaries of the 51 indicators are available at no cost on the Pembina Institute's website at www.pembina.org.

occurred after the release of the original ISEW in *The Common Good* by Daly and Cobb (1989) and then again with the release of the reconstituted U.S. GPI by Redefining Progress. The debate over the ISEW was captured in a remarkably candid academic dialogue published in *The Green National Product: A Proposed Index of Sustainable Economic Welfare* by John Cobb Jr. and Clifford Cobb (1994), which ironically is now out of print. Subsequent releases of the U.S. GPI in 1999 (Anielski and Rowe) and again in 2000 (Cobb *et. al.*) received less attention. The recent release of the Australian GPI by Hamilton (2000) has sparked some debate in Australia.[18]

The GPI accounting framework has a number of strengths.

1. It provides an attractive accounting framework, based on general accounting principles, for measuring the sustainability and condition, trends and full monetary aspects of all capital.
2. GPI Accounting takes a systems approach, recognizing the interrelationship of a complex array of variables that define well-being.
3. The GPI Accounting framework could be applied at any level of governance—local, provincial or national—and possibly be applied to corporate governance depending on the availability of data.
4. The GPI accounts have a transparent and open architecture, using the best available data and scholarly analysis of the issues.
5. The GPI Accounts are meant to be "living" or dynamic accounts improving with better information, knowledge and shifting societal values.
6. The GPI Accounts can be aligned with existing government reporting and performance measurement systems to facilitate business planning and budgeting with a view to sustainability of all capital.

The shortcomings of the GPI Accounting framework are primarily related to the shortcomings of statistical data, indexing, weighting of indicators and aggregation into composite indices. First, data are a chronic limiting factor in constructing such comprehensive longitudinal data sets, sometimes requiring heroic assumptions and statistical extrapolations that would otherwise make such an accounting exercise futile. Changes in methods of gathering, surveying and analyzing statistical data often led to frustration in constructing a 40-year time series for each GPI account for Alberta. In the absence of 40 years of data we either had to extrapolate missing data points, project data back in time or simply leave some data gaps. These data constraints are best appreciated when one understands the tenuous nature of traditional data sets that include the GDP.

Second, the GPI Accounts may be criticized for selection bias. Some might argue that the picture of sustainability is biased by the selection of indicators, the selection of benchmarks for indexing and the assumption that all indicators are equally weighted in computing a composite index. These are all valid concerns and we welcome input as to how these shortcomings might be rectified. We believe that a process of citizen engagement and dialogue could suggest a value set for a community that could then be applied to a GPI account to yield an index that accords with citizen and community values. Such processes would also help to build community as a result of the dialogue about values and genuine well-being With a robust, inclusive and transparent citizen engagement process whereby a GPI preliminary account might be constructed to launch the discussion, a meaningful set of indicators would emerge that align with the values of the community. Moreover, citizens could then become engaged in gathering, analyzing and debating the information that is fed into GPI accounts. Communities would be better equipped with a well-being diagnostic tool to measure and track changes in the condition of living capital and produced capital and thus to manage for a sustainable future.

A third potential criticism is that we rely primarily on quantitative data and less on qualitative or subjective data. We believe there is considerable scope for considering this type of input given that well-being can be a subjective and sometimes personal assessment.

Fourth, estimating the full benefits and costs associated with the consumption and stewardship of human, social and natural capital is a challenge. In many cases, such information has never been collected. Sometimes a single study estimating costs or benefits must be applied over a longitudinal data set, which clearly is unsatisfactory. The fact that we receive hourly or daily data on the stock market yet have poor information on the full costs associated with real wealth or living capital says a great deal about what we count as meaningful. Traditional accounting methods have shied away from placing monetary values, in the absence of markets, on so-called intangible or non-market assets. Yet, there are real, monetary costs attached to living capital even if these assets go unpriced in a marketplace. Discerning the true costs of such things as air pollution or auto crashes is possible with some effort. Great caution must be exercised to avoid double counting of either costs or benefits in the GPI accounts, which may invalidate some figures. This underscores a key problem with placing money values based on "rubber yardsticks" (called dollars) on wealth that may have no money-market substitutes or be irreplaceable.

Our goal was to develop a non-prescriptive well-being and sustainable development accounting system that is open, transparent, and dynamic and that evolves over time. The GPI Accounts for Alberta were constructed to be meaningful to citizens and to be a practical decision-making tool for the holistic management of the condition of human, social, built, financial and natural capital assets, liabilities and equity. We believe we have done this. We also believe that GPI accounts should be unique—customized according to the needs of each community they serve. We do not think that GPI accounting practices should be universal. Indeed, values and notions of genuine well-being will vary across communities and GPI accounts should reflect those values. Yet, the basic architecture and methods of GPI accounting can be applied at any organizational level.

6.0 GPI Accounting: For Whom and for What?

Who would use the GPI System of Well-Being Accounts and for what purpose? Like any performance information or accounting system, the GPI Accounts are intended to provide decision makers and stakeholders (in this case citizens) with an account of the "state of the nation" or province. To answer the question "how would GPI Accounts be used to inform public policy?" we need only answer the question "How do we now use economic information (such as GDP, inflation rates, interest rates) and social indicators to orient public policy?"

The answer is that we use information to make better decisions. What gets measured gets attention, as the saying goes, and this is key to GPI Accounting and its application to public policy. With such information, decision makers can assess the current conditions and trends in living and monetary capital that are then used to better manage all forms of capital in a society.

The GPI Account for Alberta is like a house. The foundation of this house is our values, and the structural supports are the four elements of nature, economy, people and community. The sub-accounts are like the rooms in the house. We can use the information contained in these accounts like a blueprint to undertake the renovations to ensure the house (that is, Alberta) will be healthy and habitable for generations to come.

The GPI Accounts take a holistic, systems approach to measuring well-being; as in any complex task of this nature, there are difficulties. The challenges of this work, many of which have already been mentioned, include the biases inherent in trying to find a "one-size-fits-all" system for accounting for well-being and quality of life. Differences in values, morals, and ethics must also be recognized and accommodated in the accounting system. The flexibility of the Alberta GPI Account framework allows new variables, data sets, indicators and different weighting and indexing approaches to be added. This allows us to make "what if" scenario queries of the GPI Accounts and also enables citizens and decision makers to weight variables in accordance with their own values, morals, ethics or opinions. These first sets of GPI Accounts reflect, in part, the biases of the researchers and authors but are intended to catalyze a much-needed public debate about how Albertans and Canadians chart a sustainable course for the 21st century.

6.1 Using the GPI Accounts and Indicators

With its integrated approach, the GPI Accounts enable us to assess and measure well-being in both monetary and non-monetary terms. Both non-monetary and monetary accounts would be balanced without one set being more important than the other.

The GPI Accounting system can help us answer some fundamental questions about designing a sustainable future:

- What quality of life and sustainability conditions can future generations expect given today's economic behaviour?
- Are we better or worse off than we were in the past?
- Are we living off the "interest" of natural capital or are we eroding our capital base to the detriment of future generations?
- Has our overall quality of life improved compared with the past 40 years?
- What is the condition of our environment and the state of our natural capital assets?
- Are we on a sustainable or unsustainable path?
- Do we have more or less quality time with family and friends?
- Are we more or less stressed today than in 1960?
- What has been our return on investment in human, intellectual and natural capital over the past 40 years?
- Are we more or less eco-efficient and energy efficient than in the past?
- How do Canada's and Alberta's ecological footprints compare with natural global carrying capacity and what does the size of these footprints imply in terms of equity for other citizens of the world?
- What burden or long-term liability do increasing debt and shrinking savings impose on households, individuals and government?

The GPI Accounts can also be used to check the values and changing priorities of citizens and governments. They give us a snapshot of where we are today (which is the outcome of past activities and decisions), and a blueprint to design the future we want tomorrow.

Indicators are vital for informing policy makers and society in general about the progress being made in the journey toward sustainability. With the abundance of quantitative and qualitative information now available, we are able, for possibly the first time in history, to manage many large and complex data sets. This capacity means we can intelligently pursue a multi-dimensional, integrated approach to tracking trends in human, social, economic and ecological well-being.

6.2 Using the GPI Balance Sheets

The GPI Balance Sheet Accounts illustrate the risks to sustainability that may be emerging; these include water and air quality liabilities, timber sustainability liabilities, toxic waste risks, time stresses and financial liabilities. Such liabilities to sustained well-being could be identified as part of a strategic business-planning process for government or a community.

The GPI Balance Sheets also examine the distribution of income and wealth. In whose hands are Alberta's assets or capital held and, thus, in whose hands is the future sustainability of capital being held? Growing inequality in income, wealth or ownership of built, financial and natural capital would be flagged as a potential threat to social and community cohesion. This may generate discussions about the degree of inequality that is acceptable in a civil society and subsequent exploration of policies that would ensure wealth is more equitably distributed.

The GPI Balance Sheet and indicators are not intended to be prescriptive about what actions should be taken in the future, given current traditions or trends over time. Nor do they suggest that thresholds to sustainable well-being can be readily discerned. They simply reveal existing conditions in the context of historical change. They cause us to pause and reflect: is our journey sustainable or do we need to make mid-course corrections?

6.3 The GPI Income Statement—A Tool for Budgeting

The strength of GPI accounting is that it considers both the physical condition of living capital assets and the revealed monetary costs and benefits associated with consuming this capital. With a more complete accounting tool, decision makers are better equipped to manage on a physical, qualitative and fiscal basis.

The monetary GPI Accounts can be an effective budgeting tool to determine the best investment of tax dollars to address public policy issues. Identifying key regrettable expenditure drivers of GDP growth can lead to budgetary decisions to minimize or mitigate these costs. For example, if increasing crime rates are driving up the costs of protecting public and household safety, which subsequently contribute to rising GDP, then such conditions can be more effectively managed with the full-cost evidence contained in the GPI accounts. Also, costs such as the depletion of oil and gas inventory should be treated as depreciation of our natural capital and identified as a cost to GDP rather than a benefit, as accounting convention dictates. On the positive side, unaccounted-for benefits from unpaid work (parenting, housework, volunteering) can be assigned a replacement market value and compared with the value of paid work, which is included in the GDP figures. For example, if volunteer hours in the community are rising while going unaccounted for in the GDP figures as a genuine contribution to societal and economic well-being, then the market value of those volunteer hours can be an important piece of information for guiding economic and fiscal policy.

The information could also be used to compare and align performance outcome measures for assessing the utility of government policy and actions. Assessing the outcome "returns" (improved well-being) on investment of public tax dollars could become more explicit using GPI accounts.

The GPI Income statement thus has a direct link to budget decision making at all levels of society. Combining the GPI Income Statement with the GPI Sustainability Circle indicators would give decision makers a more robust measurement and accounting system upon which to make more informed and integrated decisions about the economy, environment and society.

Imagine a Finance or Treasury Minister who is more keenly aware that as he or she reports on rising GDP figures, other evidence of the condition and costs of consuming living capital stocks is also reported. This could include evidence of the regrettable degradation of natural resource stocks, environmental quality, or social and human health costs. Budgetary and investment decision making are potentially improved as money is allocated to improve the conditions of living capital in the interest of sustaining its capacity for current and future generations. Equipped with such information it would be possible to assess how genuine economic well-being might be enhanced or sustained without compromising the living capital that defines well-being.

6.4 A Tool to Empower Citizens

GPI accounts give citizens information about the conditions of their overall well-being, showing trends in the condition of the environment, economy and society as these trends affect our quality of life. They expand our perspective and balance the current predominant focus on money by considering the physical and qualitative dimensions of people, communities, and the environment.

The information and indicators derived from the GPI accounts contain a wealth of information that can show clearly how changes in economic well-being at the individual and household level (e.g., real disposable income, debt, taxes and consumption spending) compare with other communities and what their relationship is to trends in human health, community well-being and environmental health.

6.5 Using GPI Accounting to Develop Public Policy

GPI accounts can support public policy development. They provide vital information for holistic and integrated policy decision making, covering virtually every area of government policy. Such a holistic perspective on quality of life and well-being presents a rare and important opportunity to synthesize processes, policies and information.

Examining the total condition of a society is essential to understanding what constitutes a civil, good and sustainable society. GPI accounting offers individuals, households and communities holistic and practical tools to examine overall well-being and sustainability issues. The accounts give citizens unique opportunities to participate in evidence-based discussion and decision making about quality of life and sustainability. GPI accounts should include meaningful indicators that paint a holistic portrait of well-being. If sustainable development is a journey, then GPI accounting provides a compass to help steer the course. GPI accounts are management tools for improving overall well-being and ensuring the sustained stewardship of all living capital. GPI accounting helps citizens understand the tradeoffs and impacts of their individual and collective lifestyle choices on the well-being of their neighbours, other communities and the natural environment. GPI accounting helps decision makers get to the heart of the question: are we on a sustainable course?

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NOTE TO THE READER: The references in this list were consulted during the research for the full Alberta GPI study. They are listed here to give a sense of the scope of the project and to assist those who may wish to obtain additional information. Only a few are actually cited in this document.

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Appendix A. List of Alberta GPI Background Reports

A series of Alberta GPI background reports accompanies the *Alberta Sustainability Trends 2000* report and this report. These documents are being released in late 2001 and early 2002 and will be available on the Pembina Institute's website at www.pembina.org.

Table 11: Alberta GPI Background Reports and Sustainability Indicators

GPI Background Reports	GPI Accounts Covered by Report
1. Economy, GDP and Trade	• Economic growth (GDP) • Economic diversity • Trade
2. Personal Consumption Expenditures, Disposable Income and Savings	• Disposable income • Personal expenditures • Taxes • Savings rate
3. Money, Debt, Assets and Net Worth	• Household debt
4. Income Inequality, Poverty and Living Wages	• Income distribution • Poverty
5. Household and Public Infrastructure	• Public infrastructure • Household infrastructure
6. Employment	• Weekly wage rate • Unemployment • Underemployment
7. Transportation	• Transportation expenditures
8. Time Use	• Paid work time • Household work • Parenting and eldercare • Free time • Volunteerism • Commuting time
9. Human Health and Wellness	• Life expectancy • Premature mortality • Infant mortality • Obesity
10. Suicide	• Suicide
11. Substance Abuse: Alcohol, Drugs and Tobacco	• Drug use (youth)
12. Auto Crashes and Accidents	• Auto crashes
13. Family Breakdown	• Divorce
14. Crime	• Crime
15. Gambling	• Problem gambling
16. Democracy	• Voter participation
17. Intellectual Capital and Educational Attainment	• Educational attainment
18. Energy (Oil, Gas, Coal and Renewable)	• Oil and gas reserve life • Oilsands reserve life
19. Agriculture	• Agricultural sustainability
20. Forests	• Timber sustainability • Forest fragmentation

GPI Background Reports	GPI Accounts Covered by Report
21. Parks and Wilderness	• Parks and wilderness
22. Fish and Wildlife	• Fish and wildlife
23. Wetlands and Peatlands	• Wetlands • Peatlands
24. Water Resource and Quality	• Water quality
25. Energy Use Intensity, Greenhouse Gas Emissions and Air Quality	• Energy use intensity • Air quality-related emissions • Greenhouse gas emissions
26. Carbon Budget	• Carbon budget deficit
27. Municipal and Hazardous Waste	• Hazardous waste • Landfill waste
28. Ecological Footprint	• Ecological footprint

Appendix B. Measurement Models and Tools

B1 The U.S. Genuine Progress Indicator

The Alberta GPI Income statement is modeled on the original U.S. GPI and the new Australian GPI frameworks. First released as the ISEW (Index for Sustainable Economic Welfare) by Daly and Cobb (1989), the Genuine Progress Indicator (GPI) emerged out of the economic think-tank Redefining Progress in 1995 under the leadership of Cliff Cobb, the original developer of the ISEW. Updated in 1999 by Anielski and Rowe and subsequently in 2000 by Cobb (www.rprogress.org) the U.S. GPI for Redefining Progress, the GPI presents a modified GDP measure to account for sustainable economic welfare.

The GPI and ISEW were developed to offer an alternative to the GDP and national income accountancy by providing a new income statement of the nation that adds unaccounted benefits of unpaid work, infrastructure services and other benefits missing in the GDP, and subtracts regrettable human, social and natural capital depreciation costs. The GPI explicitly treats these "costs" and "benefits" as a reflection of the changes in the condition (albeit, expressed in monetary terms) of these capital assets that contribute to well-being. Over 20 aspects of economic life are considered in this full cost-benefit accounting of total capital.

While many different models for measuring quality of life and sustainable development have been developed, we feel that the U.S. GPI[19] and its predecessor, the ISEW provide the best model for measuring well-being and sustainability.

The GPI-ISEW is intended as a more complete measure of economic, social and environmental well-being. The GPI-ISEW is a kind of "balanced scorecard" for the nation that takes as its starting point the broadest measure of economic progress—the gross domestic product or GDP—and adjusts for the full benefits and costs related to environmental, social and human capital that are currently ignored in the GDP figures or where the consumption of these forms of capital is treated as income rather than as a regrettable cost or depreciation cost. The GPI, by contrast, begins with personal consumption expenditures (which make up 65 percent of U.S. GDP), then makes 24 adjustments (both positive and negative) for the values noted in Table 12 below.

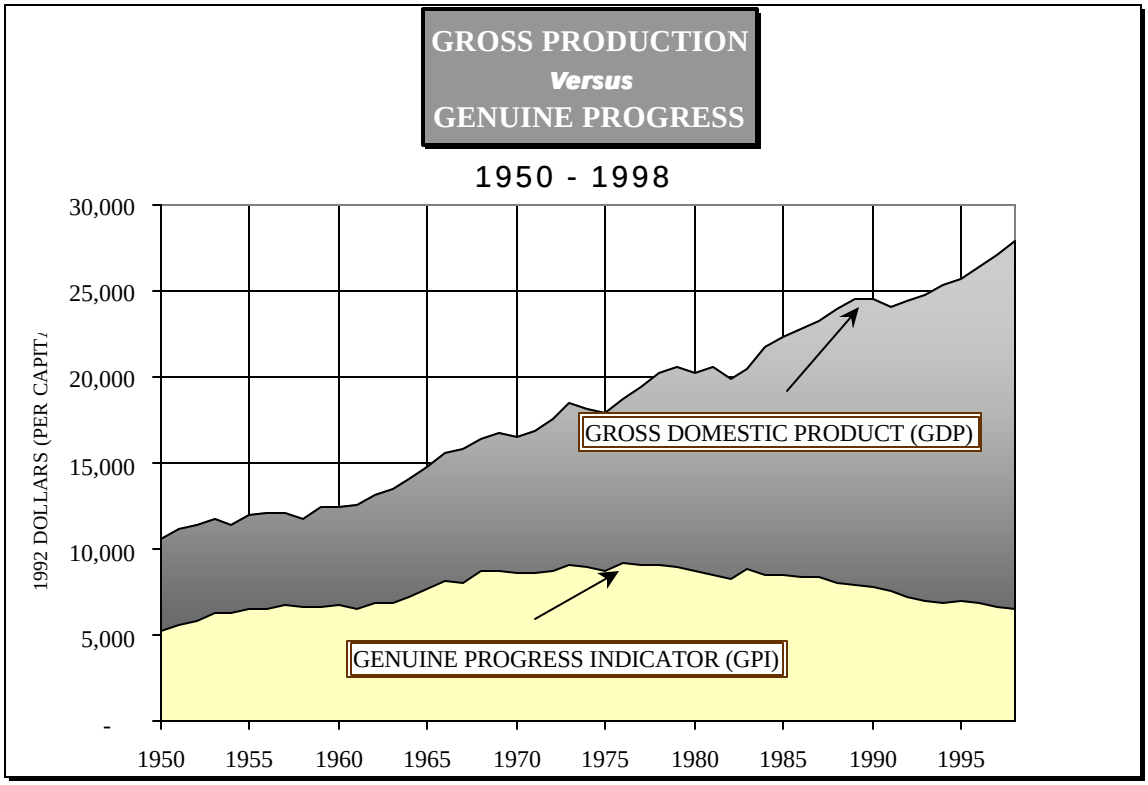
Table 12: U.S. Genuine Progress Indicator Components

COMPONENTS OF THE GPI		
Column	**Item**	Adjustment
A	Personal Consumption	positive
B	Income Distribution	(adjusts consumption)
C	Personal Consumption Weighted for Consumption	B ÷ C
D	Value of Household Work and Parenting	positive
E	Value of Volunteer Work	positive
F	Services of Consumer Durables	positive
G	Services of Highways and Streets	positive
H	Cost of Crime	negative
I	Cost of Family Breakdown	negative
J	Loss of Leisure Time	negative
K	Cost of Underemployment	negative
L	Cost of Consumer Durables	negative
M	Cost of Commuting	negative
N	Cost of Household Pollution Abatement	negative
O	Cost of Automobile Accidents	negative
P	Cost of Water Pollution	negative
Q	Cost of Air Pollution	negative
R	Cost of Noise Pollution	negative
S	Loss of Wetlands	negative
T	Loss of Farmlands	negative
U	Depletion of Nonrenewable Energy Resources	negative
V	Other Long-term Environmental Damage	negative
W	Cost of Ozone Depletion	negative
X	Loss of Old Growth Forests	negative
Y	Net Capital Investment	positive/negative
Z	Net Foreign Lending or Borrowing	positive/negative

Source: Anielski, Mark and Jonathan Rowe. 1999. *The 1998 U.S. Genuine Progress Indicator (GPI) Summary Report*. Redefining Progress, San Francisco, January 1999 (available at www.rprogress.org)

The U.S. results have shown a continual decline in the GPI since the mid 1970s while the GDP continues to grow. The key factors driving GPI downwards include rising income inequality, erosion of leisure time, increasing foreign indebtedness, and the growing costs of environmental liabilities from fossil fuel consumption. Figure 14 shows the 1999 U.S. GPI results.

Figure 13: The U.S. GDP and Genuine Progress Indicator 1950 to 1998



Source: Redefining Progress. *www.progress.org*

Although still a pilot measure of well-being of the nation expressed in economic terms, the GPI or ISEW has been replicated in a number of developed nations including Austria, Australia, Britain, Germany, Sweden, and the Netherlands. Hans Messinger with Statistics Canada has made a preliminary estimate for Canada. The strength of the GPI framework is its open and transparent system of accounting for the physical and economic (monetary) dimensions of human, social, environmental and economic (produced, financial) capital or wealth. At the same time, it allows for the development of a single "bottom line" expressed in monetary terms, adding up the full costs and benefits associated with sustainable living. There is considerable room for improving the original GPI framework by considering the relevance of adopting traditional accounting conventions for financial statements that would include physical inventories, balance sheet (assets, liabilities, equity), income statements (revenues and costs) and performance indicators that are derived from the GPI accounts.

B2 The Australian GPI

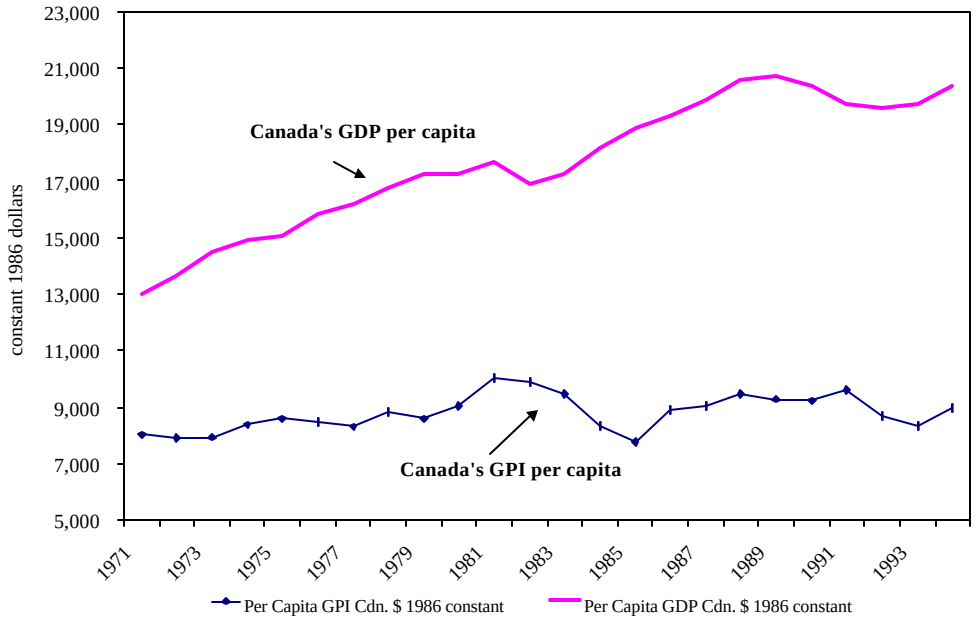
The **Australian GPI** for 2000 (Hamilton 2000),[20] which covers the period 1950 to 2000, includes some additional components and improved methodologies (see www.gpionline.net for details) over the original U.S. GPI model. Components of the Australian GPI are listed below; components unique to the Australian GPI are in bold.

- Personal consumption
- Income distribution
- Public consumption expenditure
- Value of household and community work
- Costs of unemployment
- Costs of underemployment
- Costs of overwork
- **Private defensive expenditure on health and education**
- Services of public capital
- Costs of commuting
- Costs of noise pollution
- Costs of transport accidents
- **Costs of industrial accidents**
- **Costs of irrigation water use**
- Costs of urban water pollution
- Costs of air pollution
- Costs of land degradation
- Costs of loss of native forests
- Costs of depletion of non-renewable energy resources
- Costs of climate change
- Costs of ozone depletion
- Costs of crime
- **Costs of problem gambling**
- **Value of advertising**
- Net capital growth
- Net foreign lending

B3 The Canadian GPI Estimates

Using U.S. GPI framework Messinger and Tarasofsky (1997) estimated a preliminary GPI for Canada from 1971 to 1997. The results (Figure 14) differ somewhat from the U.S. GPI with Canada's leveling off since the mid 1970s compared to a declining U.S. GPI since 1974. The primary difference is less income inequality in Canada.

Figure 14: Canada's Preliminary GPI Estimates



Source: Messinger and Tarasosfky (1997)

The original GPI and ISEW architectures have their shortcomings and critics. Neumayer (1998)[21] argues that the policy relevance of the ISEW is questionable because the measure "rests on arbitrary assumptions and can be shown to be invalid as a reliable indicator of welfare and sustainability." These include the assumption that rising income inequality can be translated into a monetary adjustment of personal consumption expenditures and thus an expression of reduced economic welfare. Neumayer further questions the assumptions in the U.S. GPI estimate for cost of non-renewable resource depletion and notes how changes in methodologies and assumptions about substitution prices for fossil fuels (and inflating these costs) can change the outcome of the U.S. GPI results markedly. He says the ISEW is another example of falling into the measurement trap of "misplaced concreteness"—that is, a misplaced desire for a single, clear-cut indicator of both welfare and sustainability. These critiques are important because they suggest that rather than discounting the GPI accounting framework, more research and work are needed to improve methods and to test various assumptions and "what if" scenarios for well-being outcomes.

Another weakness of the U.S. GPI is that it is primarily a monetary measure of well-being addressing specifically the shortcomings of the GDP, but it is not a measure of the quantitative or qualitative condition or state of human, social, produced and natural capital. The Alberta GPI Accounting system is an attempt to create two sets of accounts: 1) physical (quantitative) or qualitative state (condition) of capital or wealth accounts, and 2) full benefits and costs of capital consumption and services, similar to the U.S. and Australian GPI estimates for sustainable economic welfare.

B4 The Index for Social Health

Measuring the well-being of individuals, households or communities is a complex matter. There is no common accounting convention for measuring quality of life, social health or sustainability of human and social capital. In the health profession, measurement efforts focus on assessing the determinants of human health; typical measures are life expectancy, premature mortality, disease, infant mortality, and premature births. Measures of the health or sustainability of households are generally rare since we often do not take account of the welfare of the family and households other than tracking the dimensions of economic well-being such as personal consumption patterns, income, savings, and debt. At the community or societal level measures of the health or sustainability of communities might include measures such as crime.

One of the most innovative and comprehensive indices of social health to emerge has been the Index for Social Health (ISH) developed by Prof. Marc Miringoff (Miringoff and Miringoff 1999) at Fordham University (for U.S. ISH results see Brink and Zeesman 1997). The U.S. Index was developed to track roughly 17 human health and social indicators of well-being. Using an indexing system, each indicator is derived from raw data then converted to an index. To standardize indicators, each indicator's raw data is converted to an index scored on a scale of 0 to 100, where best performance is scored at 100 and worst performance is set to zero. This standardization makes aggregation of multiple indicators possible to show composite performance of a multiple of indicators. Weighting or non-weighting of individual indicators is possible with this indexing system, though Mirningoff opts for a non-weighting system, avoiding the problem of picking one indicator over another in importance. This indexing allows researchers and users to assess trends over time as well as compare current performance against a best-performance benchmark in the time series.

Satya Brink and Allen Zeesman (1997) of Human Resources Development Canada estimated an ISH for Canada and the provinces for the period 1970 to 1995. The Canadian ISH, slightly modified from the U.S. index, comprises 15 indicators of human health, including:

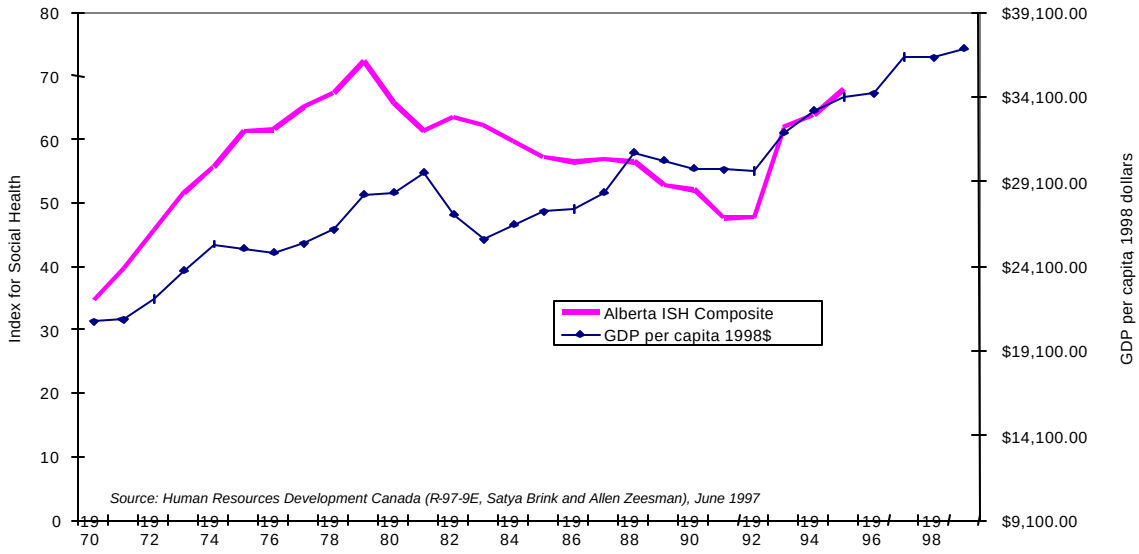
- Infant mortality
- Child abuse
- Child poverty
- Teen suicide
- Drug abuse
- High School drop out
- Unemployment
- Average weekly earnings
- Poverty of seniors (65+ years)
- Out of pocket health costs (health spending per capita)
- Homicide (violent crime)
- Alcohol related fatalities (auto crash fatalities)
- CAP (Canada Assistance Program) beneficiaries
- Access to affordable housing
- Gap between rich and poor

According to the Brink and Zeesman study, Alberta's ISH (Figure 15) rose faster than Alberta's GDP growth (1998 dollars) until 1979. The ISH dropped after 1979 following, in part, the recession of 1981-1982. The Index had a low of 24 in 1970 and a high of 72 in 1979. The Index then declined steadily after 1979 to a low of 47 in 1991-1992 then recovered to 68 in 1995. The

Alberta ISH has not been updated since this first release. It is possible to reconstruct the index drawing from some of the data in the Alberta GPI Accounts, although not all data are accessible.

In most cases the ISH appears to be consistent with changes in the GDP. The key drivers of the decline in Alberta's Index for Social Health throughout the 1980s were increasing child abuse, increased child poverty and youth drug abuse.

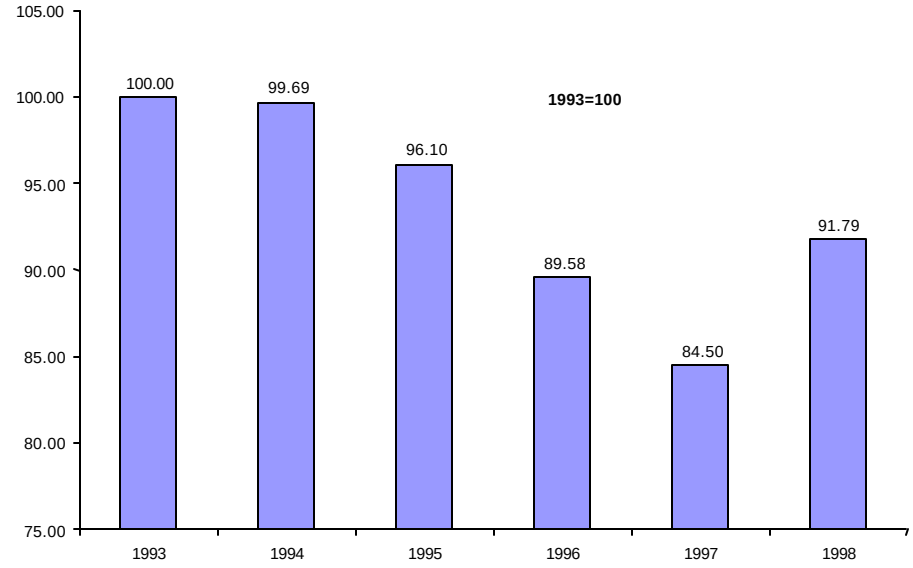
Figure 15: Alberta Index for Social Health versus GDP per capita, 1998$



The ISH framework provides an intuitively attractive system that incorporates a number of meaningful social and human capital indicators into a composite index. Each component in the ISH can be viewed separately, either as an individual index or in the form of raw data. This is consistent with the Alberta GPI accounting structure. Indeed, the indexing of raw data used in the Alberta GPI System of Well-Being accounts is similar to the ISH framework, with exceptions made for benchmarking.

Another example of an application of the ISH model is Anielski's 1999 work on the Edmonton Social Health Index for the Edmonton Social Planning Council. Figure 16 shows the graphical results of a composite social health index from 1993 to 1999 using indicators that were aggregated by normalizing the original raw data set.

Figure 16: Edmonton Social Health Index, 1993 to 1999



Source: Edmonton Social Planning Council. Edmonton Social Health Index, in "Tracking the Trends: Social Health in Edmonton, June 2000

The Edmonton Social Health Index (ESHI) was developed by the Edmonton Social Planning Council to track trends in the social health of Edmonton.[22] The ESHI is composed of 15 indicators of social, health, and economic and other indicators:

1. Life expectancy
2. Premature deaths
3. Low birth-weight babies
4. Teen birth rate
5. Suicide rates
6. Crisis support calls
7. Incidence of STDs
8. Child welfare case loads
9. Foodbank use
10. Percent of economic families in poverty (living below LICO – low income cutoff)
11. Single parent households
12. Personal bankruptcies
13. Property crime rates
14. Reports of domestic violence
15. Violent crime rate

These indicators provide a time series from 1993 (benchmark year) to 1998. Each indicator's raw data set is then converted to a normalized index using 1993 as the benchmark year and converting it to 100 points. All indicators can then be added up assuming equal weighting to yield a composite index of all 15 individual indicators. The higher the values (greater than 100), the greater the improvement in social health, while a value less than 100 indicates a decline.

Other examples of composite indices include the **Social Problem Index** (SPI) developed by Dr. Gus Thompson (University of Alberta, Public Health Sciences) for Alberta and Canada. Like the ESHI it is a composite index comprising several social and human health indicators. The United

Nations' Human Development Index (HDI) is another example combining five equally weighted indicators of economic, human health and education indicators into a composite measure to compare nations. Pierce County (Washington) has also adopted an indexing system of 80 measures of quality of life into a Pierce County Quality of Life Index. Economists Lars Osberg and Andrew Sharpe have developed the **Index for Economic Well-Being (IEWB)** for Canada and several OECD countries. The IEWB is a composite index of various economic, social and environmental indicators that are expressed in normative (indexed) terms and weighted based on the values of different observers involved in the construction.

B5 U.S. Sustainable Development Indicators

Building on the pioneering work of the U.S. President's Council on Sustainable Development, the U.S. Interagency Working Group on Sustainable Development Indicators has advanced a set of measurement indicators for moving the U.S. economy towards a sustainable future. The inclusion of other human health and social capital indicators, drawing from public health sciences, social sciences and from statistical data basis such as the United Nations Human Development Report, would help complete an integrated system of well-being accounts to measure the total capital health of nations. Many of the issues and indicators in Table 13 align with the Alberta GPI accounting framework.

Table 13: U.S. Sustainable Development Indicators

Sustainability Issue	Sustainability Indicator
1. Economic prosperity	• Capital assets • Labor productivity • Domestic product (GDP)
2. Fiscal responsibility	• Inflation • Federal debt-to-GDP ratio
3. Science and technology advancement	• Investment in R&D as % of GDP
4. Employment	• Unemployment
5. Equity	• Income distribution • People in census tracts with 40% or greater poverty
6. Housing	• Home ownership rates • Percentage of households in problem housing
7. Consumption	• Energy consumption per capita and per dollar of GDP • Materials consumption per capita and dollar of GDP • Consumption expenditures per capita
8. Status of Natural Resources	• Conversion of cropland to other uses • Soil erosion rates • Ratio of renewable water supply to withdrawals • Fisheries utilization • Timber growth to removals balance
9. Air and water quality	• Surface water quality • Metropolitan air quality non attainment
10. Contamination and Hazardous Materials	• Contamination in biota • Identification and management of Superfund sites • Quantity of spent nuclear fuel
11. Ecosystem Integrity	• Acres of major terrestrial ecosystems • Invasive alien species
20. Global Climate Change	• Greenhouse gas emissions • Greenhouse climate response index
21. Stratospheric Ozone Depletion	• Status of stratospheric ozone

Sustainability Issue	Sustainability Indicator
22. Population	• U.S. population
23. Family Structure	• Children living in families with one parent present • Births to single mothers
24. Arts and Recreation	• Outdoor recreation activities • Participation in the arts and recreation
25. Community Involvement Education	• Contributing time and money to charities • Teacher training level and application of qualifications • Educational attainment by level • Educational achievement rates
26. Public Safety	• Crime rate
27. Public Health	• Life expectancy at birth

Source: Based on U.S. Interagency Working Group on Sustainable Development Indicators (1998).

Appendix C. Alberta GPI Accounts, Raw and Indexed Data Sets

The tables in this Appendix pertain to the Alberta GPI accounts from 1961 to 1999. They show both raw data and indexed data as well as a table with the total cost and benefit information from 1961 to 1999 used in the GPI net sustainable income statement.

Table 14 shows the Alberta GPI raw data set. More detailed information for each of the 51 indicators is provided in the various Alberta GPI background reports.

Table 15 shows the Alberta GPI indicators converted whereby raw data (Table 14) has been normalized or indexed. For each of the 51 indicators the benchmark optimal condition is noted at the top of each column heading. These benchmarks are used to establish the index time series for each indicator.

Table 16 shows the details of cost and benefit estimates used to construct the Alberta GPI net sustainable income (or net sustainable economic welfare) statement for the period 1961 to 1999. For a more detailed description of the cost and benefit estimate methodologies, please see the GPI background reports.

Table 14: Alberta GPI Raw Data Files

	Economic growth	Economic diversity	Trade balance	Disposable income	Weekly wage rate	Personal expenditures	Transportation expenditures	Taxes	Savings rate
	GDP at market prices, expenditure based (1998$ per capita)	Economic Diversification Index, based on Hachman Index (closer to one means closer to national average)	Trade balance (exports less imports) per capita (1998$)	Personal disposable income (per capita 1998$)	Weekly wage rate, $1998	Alberta personal consumption expenditures (per capita, constant [1998] dollars)	Direct expenditure per capita on transportation in Alberta, including public transit (1998$)	Taxes on persons (per capita, 1998$)	Savings rate as percentage of after-tax disposable income
1961	$ 16,395.10		$ (393.32)	$ 9,466.52	446.13	$ 8,747.39	137.50	$ 870.28	3.70
1962	$ 16,806.49		$ (596.96)	$ 9,516.28	427.34	$ 8,955.47	152.69	$ 908.77	4.90
1963	$ 17,261.06		$ (205.60)	$ 9,627.61	410.53	$ 9,058.83	168.23	$ 926.47	4.80
1964	$ 17,711.50		$ (296.15)	$ 9,730.85	407.23	$ 9,300.86	186.26	$ 1,010.01	3.30
1965	$ 18,425.65		$ (560.62)	$ 10,356.98	417.65	$ 9,653.23	208.46	$ 1,089.94	5.80
1966	$ 19,552.78		$ (695.54)	$ 11,044.27	435.07	$ 10,151.95	224.90	$ 1,339.27	6.70
1967	$ 19,424.00		$ (1,036.96)	$ 11,059.01	456.62	$ 10,239.48	237.40	$ 1,575.56	4.70
1968	$ 19,603.99		$ (1,463.28)	$ 11,225.25	457.97	$ 10,493.61	254.16	$ 1,756.16	4.00
1969	$ 20,161.24		$ (1,951.09)	$ 11,443.45	484.13	$ 11,026.78	267.68	$ 2,100.06	2.00
1970	$ 20,834.74		$ (522.47)	$ 11,178.74	494.31	$ 10,985.63	261.52	$ 2,257.06	1.60
1971	$ 20,964.13	0.59	$ (60.31)	$ 11,417.37	520.72	$ 10,925.35	288.25	$ 1,928.16	2.70
1972	$ 22,163.00	0.53	$ 133.53	$ 12,417.56	541.26	$ 11,751.20	309.53	$ 2,029.07	5.00
1973	$ 23,840.59	0.45	$ 943.00	$ 13,843.31	562.16	$ 12,408.68	350.50	$ 2,180.26	9.30
1974	$ 25,398.69	0.23	$ 4,649.40	$ 15,264.19	596.11	$ 13,318.16	357.70	$ 2,471.29	9.90
1975	$ 25,134.56	0.17	$ 3,604.91	$ 15,819.51	630.18	$ 13,659.54	326.83	$ 2,481.51	10.70
1976	$ 24,924.88	0.16	$ 1,954.85	$ 16,530.84	643.77	$ 14,390.51	351.22	$ 2,804.86	5.70
1977	$ 25,435.82	0.13	$ 2,002.94	$ 16,672.30	656.25	$ 14,563.86	366.58	$ 2,858.27	5.10
1978	$ 26,275.81	0.13	$ 2,130.37	$ 17,673.84	642.83	$ 14,792.33	402.70	$ 2,804.76	7.40
1979	$ 28,357.85	0.12	$ 3,172.72	$ 18,957.23	651.91	$ 15,737.01	417.56	$ 2,994.36	9.00
1980	$ 28,449.45	0.10	$ 3,962.68	$ 19,733.15	665.33	$ 16,504.83	424.41	$ 3,241.73	9.80
1981	$ 29,641.92	0.09	$ 2,993.59	$ 21,848.01	740.63	$ 17,041.36	428.64	$ 3,796.76	15.49
1982	$ 27,155.60	0.08	$ 3,297.52	$ 21,329.01	754.18	$ 16,379.73	367.08	$ 3,884.88	16.23
1983	$ 25,656.17	0.07	$ 4,096.34	$ 20,000.25	720.72	$ 16,070.93	389.40	$ 3,568.98	13.34
1984	$ 26,582.54	0.07	$ 4,985.30	$ 19,776.76	701.89	$ 16,126.32	416.38	$ 3,435.81	13.36
1985	$ 27,307.16	0.07	$ 4,844.74	$ 20,621.42	703.43	$ 16,561.00	457.17	$ 3,299.26	15.39
1986	$ 27,495.16	0.17	$ 1,630.00	$ 20,046.73	682.10	$ 16,682.74	456.08	$ 3,466.66	13.04
1987	$ 28,492.27	0.17	$ 1,911.67	$ 19,169.99	665.35	$ 16,593.39	424.49	$ 3,546.03	8.40
1988	$ 30,831.92	0.27	$ 878.23	$ 20,298.41	680.82	$ 17,098.32	429.26	$ 3,592.69	10.70
1989	$ 30,345.11	0.27	$ 900.99	$ 20,790.04	681.24	$ 17,443.29	422.21	$ 3,500.79	10.00
1990	$ 29,895.63	0.22	$ 1,416.03	$ 20,522.84	693.21	$ 17,318.53	405.72	$ 4,011.30	8.62
1991	$ 29,802.24	0.34	$ 1,472.98	$ 19,874.31	685.55	$ 16,937.25	462.93	$ 3,923.21	9.67
1992	$ 29,737.19	0.32	$ 1,984.91	$ 19,400.61	687.55	$ 16,509.51	469.75	$ 3,842.42	10.05
1993	$ 32,037.65	0.29	$ 2,441.20	$ 19,735.70	699.65	$ 16,473.67	471.97	$ 3,603.55	10.23
1994	$ 33,315.88	0.29	$ 3,482.36	$ 19,405.70	689.16	$ 16,619.46	477.78	$ 3,553.64	5.52
1995	$ 34,118.07	0.34	$ 4,169.71	$ 19,595.65	672.59	$ 16,618.81	479.75	$ 3,691.20	5.77
1996	$ 34,319.36	0.22	$ 5,284.10	$ 19,386.87	665.05	$ 16,865.78	488.90	$ 3,858.76	4.60
1997	$ 36,477.99	0.22	$ 3,900.53	$ 19,901.45	705.49	$ 17,575.76	537.97	$ 4,250.98	3.97
1998	$ 36,440.23	0.29	$ 2,256.38	$ 19,645.87	724.55	$ 17,810.23	529.74	$ 5,083.15	4.88
1999	$ 37,005.04	0.23	$ 3,219.35	$ 20,147.08	718.15	$ 18,389.38	530.09	$ 5,172.30	4.73

Table 14 (cont.)

	Household debt	Public infrastructure	Household infrastructure	Poverty	Income distribution	Unemployment	Underemployment	Paid work time	Household work
	Household debt per capita (1998$)	Value of services from public infrastructure (dollars per capita, 1998$)	Value of services from household infrastructure (dollars per capita, 1998$)	Percentage of all persons living below LICO (poverty line)	Gini Coefficient (after tax and transfer income, all families)	Unemployment rate in Alberta over the study period	Underemployment rate (underemployed as a percentage of those employed)	Hours of paid work per person in the labour force per year	Household work hours per person per year
1961	$ 5,204	489.17	828.34	11.31	0.419	2.50%	0.55%	2,821.4	957.34
1962	$ 5,520	493.59	845.51	11.46	0.417	2.50%	0.55%	2,668.0	963.45
1963	$ 5,976	491.10	873.75	11.62	0.415	2.50%	0.55%	2,536.1	970.87
1964	$ 6,643	487.69	907.43	11.77	0.412	2.50%	0.55%	2,421.6	981.70
1965	$ 7,258	492.82	956.39	11.93	0.410	2.50%	0.55%	2,321.2	992.24
1966	$ 7,358	506.20	1,003.78	12.08	0.408	2.50%	0.55%	2,274.2	1,003.58
1967	$ 7,543	519.33	1,055.98	12.24	0.405	2.70%	0.60%	2,253.8	1,004.09
1968	$ 8,103	523.03	1,078.99	12.39	0.403	3.30%	0.73%	2,190.9	997.90
1969	$ 8,409	524.46	1,125.32	12.55	0.401	3.40%	0.75%	2,137.0	990.29
1970	$ 8,570	526.29	1,109.40	12.70	0.399	5.20%	1.15%	2,100.1	981.97
1971	$ 9,011	526.56	1,138.51	12.86	0.370	5.70%	1.26%	2,093.0	947.74
1972	$ 10,008	516.52	1,208.02	13.01	0.373	5.70%	1.26%	2,094.5	969.14
1973	$ 10,474	522.40	1,305.37	13.17	0.360	5.30%	1.17%	2,079.0	986.47
1974	$ 11,046	533.01	1,459.72	13.32	0.370	3.50%	0.77%	2,064.9	1,002.84
1975	$ 11,826	549.50	1,491.91	13.48	0.364	4.20%	0.93%	2,037.1	1,004.23
1976	$ 12,788	555.07	1,567.80	13.63	0.356	4.00%	0.88%	1,939.9	1,002.04
1977	$ 13,314	564.03	1,617.03	13.79	0.352	4.60%	0.87%	1,898.6	988.19
1978	$ 13,927	567.26	1,670.01	13.94	0.370	4.80%	0.97%	1,832.3	978.94
1979	$ 14,694	570.05	1,750.79	14.10	0.357	3.90%	0.84%	1,771.0	971.24
1980	$ 14,435	575.00	1,781.62	12.50	0.328	3.80%	0.84%	1,709.7	957.24
1981	$ 13,768	599.34	1,743.11	10.80	0.318	3.90%	0.82%	1,646.5	941.48
1982	$ 12,567	625.15	1,604.85	11.80	0.323	7.70%	1.63%	1,647.2	918.21
1983	$ 12,738	634.53	1,559.75	16.50	0.350	10.70%	2.86%	1,669.7	918.24
1984	$ 12,884	647.66	1,577.05	18.00	0.330	11.10%	3.37%	1,694.4	927.01
1985	$ 13,437	672.60	1,635.98	15.80	0.318	10.10%	3.54%	1,721.3	929.05
1986	$ 14,458	691.29	1,764.80	15.20	0.330	9.90%	3.29%	1,733.4	924.22
1987	$ 15,963	701.51	1,815.44	17.10	0.327	9.70%	3.51%	1,715.1	942.99
1988	$ 17,085	716.55	1,924.67	15.80	0.326	8.10%	2.90%	1,669.9	956.16
1989	$ 17,835	723.03	1,965.27	15.50	0.287	7.30%	2.75%	1,623.5	961.67
1990	$ 17,907	727.42	1,894.07	15.40	0.287	7.10%	2.64%	1,575.0	962.84
1991	$ 17,195	719.62	1,794.29	15.90	0.306	8.30%	2.96%	1,516.0	964.64
1992	$ 17,999	710.04	1,753.76	19.40	0.318	9.50%	4.12%	1,502.1	967.92
1993	$ 18,439	697.65	1,748.95	17.60	0.311	9.70%	4.91%	1,496.0	985.95
1994	$ 18,838	688.34	1,756.74	15.90	0.287	8.60%	4.88%	1,478.9	1,002.90
1995	$ 19,060	675.04	1,737.13	17.40	0.290	7.80%	4.72%	1,463.3	1,018.34
1996	$ 19,279	659.69	1,719.67	15.80	0.305	7.10%	4.30%	1,443.5	1,030.29
1997	$ 19,601	641.47	1,739.33	15.50	0.307	6.00%	3.63%	1,425.5	1,035.56
1998	$ 20,260	625.28	1,810.05	*15.50*	0.310	5.70%	3.45%	1,385.3	1,035.16
1999	$ 21,172	612.20	1,866.13	*15.50*	0.316	5.70%	3.45%	1,463.2	1,031.95

Table 14 (cont.)

	Parenting and eldercare	Free time	Volunteerism	Commuting time	Life expectancy	Premature mortality	Infant mortality	Obesity	Suicide
	Parenting and eldercare hours per person per year	Leisure hours per person per day	Volunteerism, hours per person per year	Average minutes per day per worker (includes both automobile and transit users)	Estimated blended life expectancy (years) for men (50%) and females (50%)	Person Years of Life Lost per 100,000 population from all causes of death	Infant mortality (death per 1000 live births)	Percent of adult population with a Body Mass Index greater than 27 (overweight or obese)	Suicide rate for both sexes per 100,000 population
1961	198.2	4.9	67.5	24.0	71.97	5330.26			11.1
1962	197.5	4.9	67.9	24.1	72.16	5344.87			10.5
1963	197.2	5.0	68.4	24.1	72.36	5353.09			10.3
1964	197.6	5.0	69.1	24.1	72.55	5540.25			9.5
1965	198.0	5.0	69.8	24.1	72.74	5239.21			13.4
1966	198.7	5.0	70.5	24.1	72.94	5314.20			13.6
1967	197.2	5.1	70.5	24.3	73.13	5330.54			11.8
1968	194.6	5.1	70.1	24.5	73.32	5503.01			10.9
1969	191.7	5.1	69.5	24.8	73.51	5509.15			12.0
1970	188.8	5.1	68.9	25.0	73.71	5398.75	19.1		14.4
1971	181.1	5.2	66.5	25.6	73.90	5566.07	17.9		15.2
1972	181.8	5.2	68.0	25.5	74.04	5622.25	17.5		12.3
1973	182.0	5.2	69.3	25.4	74.18	5468.64	14.2		13.9
1974	182.1	5.2	70.5	25.4	74.32	5781.47	15.06		13.8
1975	179.8	5.3	70.7	25.6	74.46	5580.06	14.89		17.2
1976	177.0	5.3	70.6	25.8	74.60	5353.71	14.25		15.9
1977	172.4	5.3	69.7	26.1	74.79	5317.33	11.13		17.3
1978	168.8	5.3	69.1	26.4	74.98	5277.98	11.44		18.1
1979	165.6	5.4	68.6	26.7	75.17	5322.45	11.43		17.3
1980	161.5	5.4	67.6	27.0	75.36	5279.42	12.58		15.3
1981	157.3	5.4	66.5	27.4	75.55	4991.43	10.6		18.2
1982	147.2	5.4	63.8	28.0	75.83	4571.86	9.81		15.9
1983	141.0	5.5	62.7	28.3	76.11	4358.26	8.41		15.7
1984	136.3	5.5	62.2	28.4	76.39	4144.87	9.64		17.1
1985	130.6	5.5	61.2	28.7	76.67	4320.81	8.03	14.0%	17.7
1986	124.0	5.5	59.9	29.0	76.95	4399.15	8.98	15.7%	12.6
1987	126.3	5.5	61.9	29.0	77.19	4187.37	7.48	17.4%	17.6
1988	127.9	5.6	63.5	29.0	77.43	3955.94	8.25	19.1%	16.2
1989	128.4	5.6	64.6	29.1	77.67	3896.71	7.5	20.8%	16.8
1990	128.3	5.7	65.4	29.3	77.91	3873.43	8.05	22.4%	14.8
1991	128.4	5.7	66.2	29.5	78.15	3842.93	6.66	23.6%	16.0
1992	128.6	5.8	67.1	29.7	78.25	3796.52	7.23	24.8%	18.1
1993	132.6	5.8	67.5	28.6	78.35	3659.72	6.65	25.9%	18.3
1994	136.3	5.8	67.8	27.6	78.45	3625.45	***7.4***	27.1%	16.0
1995	139.9	5.8	68.1	26.6	78.55	3645.05	***6.9***	28.2%	16.8
1996	142.8	5.8	68.1	25.7	78.65	3561.52	6.1	29.4%	16.6
1997	144.9	5.8	67.8	25.0	78.90	3476.61	4.9	30.6%	17.0
1998	146.0	5.8	67.1	24.3	79.15	3425.73	5.3	31.7%	14.4
1999	137.5	5.9	75.4	25.0	79.30	3372.60	5.6	32.9%	14.4

Table 14 (cont.)

	Drug use (youth)	Auto crashes	Family breakdown	Crime	Problem gambling	Voter participation	Educational attainment	Oil and gas reserve life	Oilsands reserve life
	Youth drug use (% of youth arrested for drug-use conviction)	Total auto crashes per Alberta adult (15+ years)	Divorce rate (percent of marriages that end in divorce)	Crime incidents per 100,000 people in Alberta	Estimated cost of problem gambling (1998$ per capita)	Composite voter participation rRate (federal, provincial, municipal)	Percentage of Population (15 years and over) with some post-secondary education or university degree	Average reserve life for conventional crude oil and natural gas (excludes oilsands)	Average reserve life for oilsands
1961		277.9	10%	3,527.6	42.08	53.25	3.0%	37.70	
1962		297.0	10%	3,011.9	42.08	53.25	5.3%	37.70	
1963		316.1	12%	3,255.1	42.08	59.35	7.6%	37.70	
1964		335.2	13%	3,449.7	42.08	56.93	9.8%	37.70	
1965		354.3	12%	3,405.2	42.08	55.68	12.1%	42.25	
1966		376.3	13%	3,743.5	42.08	58.80	14.4%	42.40	
1967		424.6	13%	4,113.4	42.08	60.88	16.7%	42.75	
1968		461.6	14%	4,632.6	42.08	55.55	19.0%	40.02	
1969		531.9	23%	5,053.7	42.08	55.55	21.2%	38.06	
1970	0.001125	500.8	25%	5,606.8	42.08	55.55	23.5%	33.70	
1971	0.000996	439.2	23%	5,843.3	42.08	55.00	25.8%	29.08	
1972	0.000865	441.7	23%	5,803.7	42.08	57.75	27.4%	26.81	
1973	0.000817	456.3	27%	5,910.3	42.08	57.75	28.9%	22.95	
1974	0.000756	531.1	30%	6,555.6	53.02	58.28	30.5%	20.08	
1975	0.0007	545.3	31%	6,973.8	59.51	55.18	32.1%	19.72	
1976	0.000675	448.2	32%	6,883.6	65.99	55.28	33.7%	20.37	
1977	0.000637	367.5	33%	6,583.9	69.06	53.70	35.2%	20.49	
1978	0.000652	478.0	33%	6,551.8	70.44	53.70	36.8%	19.70	
1979	0.000672	546.7	34%	6,817.3	71.09	53.63	38.4%	20.33	40.20
1980	0.001001	645.0	36%	7,292.9	68.91	46.98	39.9%	19.06	28.54
1981	0.000858	695.2	39%	7,443.6	65.34	46.98	41.5%	19.55	31.58
1982	0.000805	557.5	40%	7,424.0	63.27	48.73	42.2%	20.22	29.54
1983	0.000582	522.3	41%	7,172.4	63.65	51.88	42.8%	19.75	21.02
1984	0.000825	488.4	42%	7,158.8	69.97	53.88	43.5%	20.41	28.00
1985	0.001054	536.3	41%	7,176.8	75.18	53.88	44.1%	19.99	31.17
1986	0.001175	522.3	51%	7,050.3	79.51	46.78	44.8%	18.23	25.32
1987	0.000953	523.0	35%	7,513.2	83.45	46.78	45.5%	19.43	24.10
1988	0.001082	586.9	45%	7,982.0	87.52	48.28	46.1%	18.07	26.82
1989	0.00119	630.9	41%	7,651.0	89.52	53.40	46.8%	15.72	28.13
1990	0.001083	616.0	43%	7,961.0	89.74	53.50	47.4%	15.55	24.49
1991	0.000768	497.3	45%	8,865.0	89.91	53.50	48.1%	14.47	23.97
1992	0.000719	424.0	46%	8,265.0	193.68	53.70	48.7%	14.10	22.30
1993	0.000704	413.5	48%	7,359.0	291.15	52.75	49.4%	12.45	20.70
1994	0.000808	407.2	45%	6,467.0	382.50	52.70	50.0%	11.13	20.86
1995	0.000996	403.2	42%	6,176.0	468.07	49.68	50.7%	10.18	24.39
1996	0.001484	435.5	43%	6,061.0	544.13	49.68	51.3%	9.80	23.37
1997	0.001488	418.2	42%	6,104.0	609.24	46.63	52.1%	9.11	19.75
1998	0.001492	433.4	42%	6,006.0	674.01	48.63	53.0%	8.66	19.66
1999	0.001496	408.4	41%	5,624.2	731.11	48.63	53.8%	8.46	31.82

Table 14 (cont.)

	Energy use	Agricultural sustainability	Timber sustainability	Forest fragmentation	Parks and wilderness	Fish and wildlife	Wetlands	Peatlands	Water quality
	Total energy demand (GJ per capita)	Composite agriculture index, includes summerfallow, soil organic carbon, pesticide use, salinity, yield	Timber Sustainability Index, the ratio of annual increment (growth) divided by total harvest, energy and agriculture depletions	Percentage of Alberta's forests (Boreal and Foothills) that remain unfragmented, based on WRI report	Area Protected (square km)	Average of caribou (benchmark year =100), bears (target of 2500 bears in province) and sport and commercial fisheries (benchmark year =100)	Wetlands area remaining in sq. km	Peatlands, area change per annum (million ha)	Average Water Quality Index
1961	338.08	44.70	3.90	96.7%	55,000	60.08	17,651	0.0021	
1962	328.73	46.47	4.08	95.8%	55,100	59.59	17,551	0.0021	
1963	339.19	48.78	4.10	94.8%	55,200	59.11	17,452	0.0021	
1964	351.97	48.71	4.73	93.9%	55,300	58.63	17,352	0.0021	
1965	362.95	49.27	4.69	93.3%	55,400	58.15	17,253	0.0021	
1966	380.35	52.56	3.86	91.5%	55,500	57.67	17,154	0.0021	
1967	401.91	49.98	4.33	90.0%	55,600	57.19	17,054	0.0021	
1968	397.90	51.37	3.28	88.7%	55,700	56.71	16,955	0.0021	
1969	401.95	50.82	3.74	87.4%	55,800	56.23	16,855	0.0021	
1970	414.70	48.13	3.73	86.1%	55,900	55.75	16,756	0.0021	
1971	421.43	51.89	4.24	85.0%	56,000	55.28	16,657	0.0021	
1972	435.95	47.12	3.14	83.7%	56,100	54.80	16,557	0.0021	
1973	462.86	47.59	3.91	82.4%	56,200	54.33	16,458	0.0021	
1974	503.21	45.57	3.67	81.2%	56,300	53.85	16,358	0.0021	55.02
1975	532.61	48.31	4.32	80.0%	56,400	53.38	16,259	0.0021	49.73
1976	525.90	50.29	3.56	78.6%	56,500	52.90	16,160	0.0021	49.58
1977	517.63	48.50	3.62	77.2%	56,600	52.43	16,060	0.0021	57.26
1978	532.34	50.41	3.71	75.9%	56,700	51.95	15,961	0.0021	42.59
1979	564.07	49.43	2.43	74.3%	56,800	51.48	15,861	0.0021	48.83
1980	561.17	48.48	1.26	71.5%	56,900	67.33	15,762	0.0021	51.39
1981	518.30	49.68	0.96	68.5%	57,000	66.65	15,663	0.0021	54.79
1982	537.91	50.18	1.02	65.2%	57,300	65.97	15,563	0.0021	47.01
1983	497.53	49.47	2.20	60.8%	57,600	65.28	15,464	0.0021	49.13
1984	553.71	47.99	2.13	56.8%	57,900	64.60	15,364	0.0021	49.75
1985	605.14	47.99	2.18	53.0%	58,200	63.92	15,265	0.0021	43.25
1986	624.12	51.52	1.98	49.0%	58,500	61.23	15,166	0.0021	45.65
1987	638.42	50.35	1.55	43.5%	58,800	62.30	15,066	0.0021	52.16
1988	673.82	50.78	1.65	39.8%	59,100	58.33	14,967	0.0021	53.72
1989	706.27	51.54	1.85	36.9%	59,400	55.44	14,867	0.0021	39.86
1990	700.96	51.95	2.14	36.2%	59,700	53.58	14,768	0.0021	48.14
1991	681.49	55.00	2.17	34.7%	60,000	53.98	14,669	0.0021	44.35
1992	695.91	54.20	2.02	32.2%	61,000	51.58	14,569	0.0021	48.24
1993	703.75	58.77	1.47	28.0%	62,000	50.66	14,470	0.0021	55.34
1994	730.16	56.96	1.38	24.6%	63,000	51.08	14,370	0.0021	57.11
1995	733.60	59.65	0.77	22.2%	64,000	49.88	14,271	0.0021	64.33
1996	734.84	61.22	1.03	20.4%	65,000	53.30	14,200	0.0021	62.13
1997	734.08	60.06	1.03	17.0%	66,000	53.50	14,150	0.0021	66.51
1998	728.99	61.04	0.37	14.0%	67,000	54.04	14,101	0.0021	70.24
1999	753.56	61.54	0.87	10.9%	68,000	44.77	14,051	0.0021	72.73

Table 14 (cont.)

	Air quality	GHG emissions	Carbon budget deficit	Hazardous waste	Landfill waste	Ecological footprint	GDP (gross 1998$, millions)	GPI (1998$ per capita)	GDP (1998$ per capita)
	Average Air Quality Index, includes SO_2, CO_2, VOC, NOx and PM	Total greenhouse gas emissions (t) per capita	Annual GHG emissions as a % of sequestration capacity	Tonnes of hazardous waste produced per annum	Per capita disposal rate (tonnes per person per year)	Total Ecological Footprint (hectares per capita)			
1961	63.67	22.12	47.7%			6.46	21,887	$ 8,831.87	$ 16,395.10
1962	63.67	21.51	47.7%			6.64	23,075	$ 9,435.15	$ 16,806.49
1963	63.67	22.26	50.6%			6.79	24,286	$ 9,816.63	$ 17,261.06
1964	63.67	23.17	53.5%			6.89	25,345	$ 10,144.83	$ 17,711.50
1965	63.67	23.95	56.1%			7.08	26,736	$ 10,791.21	$ 18,425.65
1966	63.67	25.18	59.6%			7.42	28,645	$ 11,463.97	$ 19,552.78
1967	63.67	26.76	64.4%			7.36	29,000	$ 11,332.71	$ 19,424.00
1968	63.67	26.50	65.4%			7.61	29,935	$ 11,336.91	$ 19,603.99
1969	63.67	26.80	67.4%			8.01	31,492	$ 11,390.82	$ 20,161.24
1970	63.67	27.73	71.3%			8.34	33,273	$ 12,525.20	$ 20,834.74
1971	63.67	28.29	75.8%			8.44	34,920	$ 13,659.61	$ 20,964.13
1972	56.98	29.34	80.0%			9.07	37,546	$ 15,700.94	$ 22,163.00
1973	58.96	31.36	86.9%			9.70	41,133	$ 17,546.30	$ 23,840.59
1974	62.10	34.48	97.2%			10.18	44,565	$ 16,910.04	$ 25,398.69
1975	63.68	36.80	106.8%			9.85	45,461	$ 17,078.17	$ 25,134.56
1976	72.22	36.35	108.9%			9.65	46,592	$ 16,937.64	$ 24,924.88
1977	73.25	35.80	111.8%			9.56	49,541	$ 18,645.54	$ 25,435.82
1978	71.99	46.03	149.1%			9.75	53,124	$ 17,514.27	$ 26,275.81
1979	70.93	49.58	166.7%			10.37	59,484	$ 18,551.22	$ 28,357.85
1980	67.24	49.64	175.2%			10.28	62,373	$ 17,797.41	$ 28,449.45
1981	71.45	46.44	171.2%			10.02	68,004	$ 19,434.09	$ 29,641.92
1982	75.39	48.15	182.8%			10.02	64,311	$ 17,358.34	$ 27,155.60
1983	73.15	45.31	172.6%			9.37	61,328	$ 14,316.11	$ 25,656.17
1984	71.09	50.54	192.3%			9.62	63,534	$ 15,827.26	$ 26,582.54
1985	78.50	55.22	211.2%			10.06	65,617	$ 16,393.17	$ 27,307.16
1986	79.23	57.36	222.2%			10.02	66,837	$ 20,559.77	$ 27,495.16
1987	77.75	58.59	227.2%			10.02	69,391	$ 22,459.78	$ 28,492.27
1988	76.50	62.07	242.7%		1.04	10.52	75,684	$ 26,306.32	$ 30,831.92
1989	79.60	64.78	257.0%		1.01	10.53	75,735	$ 27,467.32	$ 30,345.11
1990	78.76	65.16	277.8%		1.00	10.43	76,163	$ 24,860.03	$ 29,895.63
1991	82.68	64.42	279.3%	16,700.0	1.01	10.06	77,264	$ 26,065.38	$ 29,802.24
1992	80.12	65.29	287.3%	13,000.0	0.91	9.88	78,338	$ 25,477.78	$ 29,737.19
1993	81.23	67.02	299.2%	13,300.0	0.89	9.88	85,564	$ 27,892.62	$ 32,037.65
1994	81.16	68.76	310.2%	21,200.0	0.80	10.13	90,116	$ 30,355.46	$ 33,315.88
1995	82.74	70.81	324.1%	59,700.0	0.74	10.38	93,479	$ 31,507.17	$ 34,118.07
1996	84.99	71.57	332.5%	21,300.0	0.76	10.71	95,430	$ 29,957.17	$ 34,319.36
1997	85.11	70.84	334.8%	38,400.0	0.82	10.83	103,495	$ 31,836.17	$ 36,477.99
1998	80.42	69.61	342.9%	28,800.0	0.79	10.68	105,927	$ 33,384.21	$ 36,440.23
1999	80.34	68.70	338.2%	46,850.0	0.75	10.74	109,708	$ 34,233.74	$ 37,005.04

Table 15: Alberta GPI Indexed Data File (from raw data, Table 14 to indexed data set)

	Economic growth	Economic diversity	Trade	Disposable income	Weekly wage rate	Personal expenditures	Transportation expenditures	Taxes	Savings rate
	GDP Index benchmark is highest GDP per capita 1998$ (1999=$37,005) = best (100 points)	Economic Diversification Index, where 100 is set equal to the level of diversification in Canada	Trade Balance Index is where maximum (1996 =$5,284) is best benchmark (100 points)	Personal Disposable Income Index, Maximum = $21,848 in 1981	Wage Rate Index, where maximum is benchmark for best	Personal Consumption Expenditure Index where maximum (1999=$18,000) is benchmark for best	Direct Transportation Index, where minimum is benchmark for best	Taxes Index where lowest (1961=$870.28) is benchmark for best	Savings Rate Index where benchmark is maximum savings rate (1982 at 16.23% of disposable after-tax income)
1961	44.3		-	43.33	59.15	47.57	100.00	100.00	22.80
1962	45.4		-	43.56	56.66	48.70	90.05	95.76	30.19
1963	46.6		-	44.07	54.43	49.26	81.74	93.93	29.58
1964	47.9		-	44.54	54.00	50.58	73.82	86.16	20.33
1965	49.8		-	47.40	55.38	52.49	65.96	79.85	35.74
1966	52.8		-	50.55	57.69	55.21	61.14	64.98	41.28
1967	52.5		-	50.62	60.54	55.68	57.92	55.24	28.96
1968	53.0		-	51.38	60.72	57.06	54.10	49.56	24.65
1969	54.5		-	52.38	64.19	59.96	51.37	41.44	12.32
1970	56.3		-	51.17	65.54	59.74	52.58	38.56	9.86
1971	56.7	100.0	-	52.26	69.04	59.41	47.70	45.14	16.64
1972	59.9	89.9	2.53	56.84	71.77	63.90	44.42	42.89	30.81
1973	64.4	75.2	17.85	63.36	74.54	67.48	39.23	39.92	57.30
1974	68.6	39.1	87.99	69.87	79.04	72.42	38.44	35.22	61.00
1975	67.9	28.5	68.22	72.41	83.56	74.28	42.07	35.07	65.93
1976	67.4	26.6	36.99	75.66	85.36	78.25	39.15	31.03	35.12
1977	68.7	21.8	37.91	76.31	87.02	79.20	37.51	30.45	31.42
1978	71.0	22.7	40.32	80.89	85.24	80.44	34.15	31.03	45.60
1979	76.6	21.0	60.04	86.77	86.44	85.58	32.93	29.06	55.45
1980	76.9	17.2	74.99	90.32	88.22	89.75	32.40	26.85	60.38
1981	80.1	15.5	56.65	100.00	98.20	92.67	32.08	22.92	95.47
1982	73.4	13.3	62.40	97.62	100.00	89.07	37.46	22.40	100.00
1983	69.3	11.4	77.52	91.54	95.56	87.39	35.31	24.38	82.20
1984	71.8	11.5	94.35	90.52	93.07	87.69	33.02	25.33	82.34
1985	73.8	11.7	91.69	94.39	93.27	90.06	30.08	26.38	94.83
1986	74.3	28.6	30.85	91.76	90.44	90.72	30.15	25.10	80.35
1987	77.0	29.1	36.18	87.74	88.22	90.23	32.39	24.54	51.73
1988	83.3	46.2	16.62	92.91	90.27	92.98	32.03	24.22	65.96
1989	82.0	46.2	17.05	95.16	90.33	94.86	32.57	24.86	61.64
1990	80.8	36.3	26.80	93.93	91.92	94.18	33.89	21.70	53.11
1991	80.5	56.8	27.88	90.97	90.90	92.10	29.70	22.18	59.56
1992	80.4	53.4	37.56	88.80	91.17	89.78	29.27	22.65	61.94
1993	86.6	48.8	46.20	90.33	92.77	89.58	29.13	24.15	63.03
1994	90.0	48.2	65.90	88.82	91.38	90.38	28.78	24.49	33.99
1995	92.2	58.0	78.91	89.69	89.18	90.37	28.66	23.58	35.57
1996	92.7	36.7	100.00	88.74	88.18	91.71	28.13	22.55	28.32
1997	98.6	37.8	73.82	91.09	93.54	95.58	25.56	20.47	24.45
1998	98.5	49.4	42.70	89.92	96.07	96.85	25.96	17.12	30.06
1999	100.0	38.5	60.93	92.21	95.22	100.00	25.94	16.83	29.15

Table 15 (cont.)

	Household debt	Public infrastructure	Household infrastructure	Number of Indices	AVERAGE ECONOMIC INDEX
	Debt Index where lowest per capita debt (1961=$13,296 per capita)	Public infrastructure index, where highest value of services per capita is benchmark for best.	Household infrastructure where highest value of services per capita is benchmark for best.		
1961	100.00	67.25	42.15	11	**56.96**
1962	94.28	67.85	43.02	11	**55.95**
1963	87.09	67.51	44.46	11	**54.43**
1964	78.34	67.04	46.17	11	**51.71**
1965	71.70	67.75	48.66	11	**52.25**
1966	70.73	69.59	51.08	11	**52.28**
1967	68.99	71.39	53.73	11	**50.51**
1968	64.22	71.90	54.90	11	**49.23**
1969	61.89	72.10	57.26	11	**47.94**
1970	60.73	72.35	56.45	11	**47.57**
1971	57.76	72.39	57.93	12	**52.91**
1972	52.00	71.01	61.47	12	**53.95**
1973	49.69	71.81	66.42	12	**57.27**
1974	47.11	73.27	74.28	12	**62.20**
1975	44.01	75.54	75.91	12	**61.12**
1976	40.70	76.31	79.78	12	**56.03**
1977	39.09	77.54	82.28	12	**55.77**
1978	37.37	77.98	84.98	12	**57.64**
1979	35.42	78.37	89.09	12	**61.39**
1980	36.05	79.05	90.66	12	**63.56**
1981	37.80	82.39	88.70	12	**66.88**
1982	41.41	85.94	81.66	12	**67.05**
1983	40.86	87.23	79.37	12	**65.18**
1984	40.39	89.04	80.25	12	**66.61**
1985	38.73	92.46	83.24	12	**68.38**
1986	36.00	95.03	89.80	12	**63.59**
1987	32.60	96.44	92.38	12	**61.54**
1988	30.46	98.51	97.93	12	**64.29**
1989	29.18	99.40	100.00	12	**64.44**
1990	29.06	100.00	96.38	12	**63.17**
1991	30.27	98.93	91.30	12	**64.26**
1992	28.91	97.61	89.24	12	**64.22**
1993	28.22	95.91	88.99	12	**65.31**
1994	27.63	94.63	89.39	12	**64.46**
1995	27.31	92.80	88.39	12	**66.22**
1996	26.99	90.69	87.50	12	**65.18**
1997	26.55	88.18	88.50	12	**63.68**
1998	25.69	85.96	92.10	12	**62.53**
1999	24.58	84.16	94.96	12	**63.54**

Table 15 (cont.)

	Poverty	Income distribution	Unemployment	Underemployment	Paid work time	Household work	Parenting and eldercare	Free time	Volunteerism
	Poverty Index is based on lowest poverty rate in Canada (PEI 1994=9.9% below LICO) set at 100 points	Income distribution index is based on the average of the after-tax Gini Coefficients for individuals and families, taking the min. Gini 0.287 in 1989, 1990 & 1994 set to 100 points	Unemployment Index where minimum (1961=2.3%) is benchmark for best	Underemployment Index where minimum (1961) underemployment is target	Paid Work Index where maximum, as long as it is less than 40 hours per week. Maximum in (2128 hours per capita) is benchmark for best	Household Unpaid Work Index where maximum is benchmark for best	Parenting and Eldercare Index where maximum (1966=199 hours per capita) is benchmark for best	Leisure Time Index where maximum (1999=5.9 hours per person per day) is benchmark for best	Volunteerism Index where maximum (1975=71 hours per person per year) is benchmark for best
1961	81.38	68.46	100.00	100.00	100.00	95.91	99.77	83.79	89.59
1962	80.28	68.83	100.00	100.00	94.56	95.30	99.42	84.22	90.09
1963	79.21	69.22	100.00	100.00	89.89	94.58	99.25	84.65	90.72
1964	78.16	69.60	100.00	100.00	85.83	93.53	99.46	85.07	91.68
1965	77.15	69.99	100.00	100.00	82.27	92.54	99.68	85.50	92.60
1966	76.16	70.39	100.00	100.00	80.61	91.49	100.00	85.93	93.61
1967	75.19	70.79	92.59	92.59	79.88	91.45	99.28	86.35	93.60
1968	74.25	71.19	75.76	75.76	77.65	92.01	97.94	86.78	92.97
1969	73.34	71.60	73.53	73.53	75.74	92.72	96.50	87.21	92.22
1970	72.44	72.01	48.08	48.08	74.43	93.51	95.04	87.63	91.40
1971	71.57	77.51	43.86	43.86	74.18	96.88	91.14	88.06	88.17
1972	70.71	76.86	43.86	43.86	74.24	94.74	91.51	88.49	90.27
1973	69.88	79.72	47.17	47.17	73.69	93.08	91.59	88.91	91.97
1974	69.07	77.62	71.43	71.43	73.19	91.56	91.67	89.34	93.59
1975	68.27	78.78	59.52	59.52	72.20	91.43	90.48	89.76	93.80
1976	67.50	80.58	62.50	62.50	68.76	91.63	89.08	90.19	93.67
1977	66.74	81.54	54.35	63.71	67.29	92.92	86.75	90.62	92.44
1978	66.00	77.55	52.08	57.14	64.94	93.80	84.93	91.04	91.63
1979	65.27	80.42	64.10	65.78	62.77	94.54	83.34	91.47	90.97
1980	73.60	87.46	65.79	65.97	60.60	95.92	81.29	91.90	89.71
1981	85.19	90.28	64.10	67.17	58.36	97.53	79.18	92.32	88.28
1982	77.97	88.74	32.47	33.87	58.38	100.00	74.07	92.75	84.61
1983	55.76	82.11	23.36	19.29	59.18	100.00	70.98	93.18	83.15
1984	51.11	86.93	22.52	16.36	60.05	99.05	68.59	93.60	82.49
1985	58.23	90.33	24.75	15.60	61.01	98.83	65.72	94.03	81.24
1986	60.53	87.07	25.25	16.78	61.44	99.35	62.43	93.82	79.43
1987	53.80	87.77	25.77	15.71	60.79	97.37	63.58	94.56	82.09
1988	58.23	87.93	30.86	19.00	59.19	96.03	64.35	95.30	84.25
1989	59.35	100.00	34.25	20.05	57.54	95.48	64.61	96.04	85.72
1990	59.74	100.00	35.21	20.88	55.82	95.36	64.59	96.78	86.77
1991	57.86	93.79	30.12	18.66	53.73	95.19	64.60	97.52	87.84
1992	47.42	90.25	26.32	13.39	53.24	94.86	64.72	98.26	89.01
1993	52.27	92.28	25.77	11.24	53.02	93.13	66.72	98.37	89.52
1994	57.86	100.00	29.07	11.30	52.42	91.56	68.62	98.49	89.97
1995	52.87	98.97	32.05	11.68	51.86	90.17	70.39	98.60	90.32
1996	58.23	94.10	35.21	12.84	51.16	89.12	71.89	98.71	90.39
1997	59.35	93.49	41.67	15.19	50.52	88.67	72.91	98.83	89.92
1998	59.35	92.58	43.86	15.99	49.10	88.70	73.48	98.94	89.01
1999	59.35	90.76	43.86	15.99	51.86	88.98	69.20	100.00	100.00

Table 15 (cont.)

	Commuting time	Life expectancy	Premature mortality	Infant mortality	Obesity	Suicide	Drug use (youth)	Auto crashes	Family breakdown
	Commuting Time Index where minimum (1961=24 minutes per person per day) is benchmark for best	Life Expectancy Index uses benchmark of maximum life expectancy 79.3 years in 1999	Person Years of Life Lost due to all causes per 100,000 population (lowest rate =100)	Infant mortality Index where benchmark is the lowest rate (4.9) in 1997	Obesity Index where the benchmark is the lowest obesity rating for 20 to 24 year olds in 1990 in Alberta at 6.8%	Benchmark is lowest suicide rate in Alberta over study period.	Youth drug use (% of youth using drugs)	Auto crashes Index benchmark where lowest (277.9 crashes per adult in 1961)= best (100 points)	Family Breakdown Index where minimum (1961=10%) is benchmark for best
1961	100.00	90.76	63.27			85.59		100.00	100.00
1962	99.76	91.00	63.10			90.48		93.57	95.12
1963	99.58	91.24	63.00			92.23		87.92	79.51
1964	99.57	91.49	60.87			100.00		82.91	75.94
1965	99.54	91.73	64.37			70.90		78.44	82.49
1966	99.55	91.97	63.46			69.85		73.84	75.20
1967	98.98	92.22	63.27			80.51		65.45	73.73
1968	98.07	92.46	61.29			87.16		60.21	70.62
1969	97.10	92.70	61.22			79.17		52.25	42.74
1970	96.10	92.95	62.47	25.65		65.97	51.73	55.49	40.21
1971	93.87	93.19	60.59	27.37		62.50	58.43	63.27	42.41
1972	94.27	93.37	59.99	28.00		77.24	67.28	62.92	42.98
1973	94.48	93.54	61.67	34.51		68.35	71.24	60.90	36.41
1974	94.63	93.72	58.33	32.54		68.84	76.98	52.32	33.47
1975	94.07	93.90	60.44	32.91		55.23	83.14	50.96	31.74
1976	93.34	94.07	63.00	34.39		59.75	86.22	62.00	30.91
1977	92.08	94.31	63.43	44.03		54.91	91.37	75.61	30.52
1978	91.06	94.55	63.90	42.83		52.49	89.26	58.13	29.92
1979	90.12	94.79	63.37	42.87		54.91	86.61	50.84	28.86
1980	88.93	95.03	63.88	38.95		62.09	58.14	43.09	27.24
1981	87.70	95.27	67.57	46.23		52.20	67.83	39.98	25.67
1982	85.88	95.62	73.77	49.95		59.75	72.30	49.85	24.92
1983	85.04	95.98	77.38	58.26		60.51	100.00	53.21	23.98
1984	84.55	96.33	81.37	50.83		55.56	70.55	56.90	23.53
1985	83.81	96.68	78.05	61.02	48.51	53.67	55.22	51.82	24.18
1986	82.97	97.04	76.66	54.57	43.30	75.40	49.53	53.21	19.62
1987	82.94	97.34	80.54	65.51	39.10	53.98	61.07	53.14	28.29
1988	82.83	97.64	85.25	59.39	35.65	58.64	53.79	47.35	21.86
1989	82.46	97.94	86.55	65.33	32.75	56.55	48.91	44.05	23.95
1990	81.94	98.25	87.07	60.87	30.29	64.19	53.74	45.11	23.16
1991	81.44	98.55	87.76	73.57	28.81	59.38	75.78	55.88	22.01
1992	81.01	98.68	88.83	67.77	27.46	52.49	80.95	65.54	21.57
1993	84.05	98.80	92.15	73.68	26.23	51.91	82.67	67.21	20.57
1994	87.19	98.93	93.03	66.22	25.11	59.38	72.03	68.25	21.96
1995	90.38	99.05	92.53	71.01	24.08	56.55	58.43	68.92	23.55
1996	93.51	99.18	94.70	80.33	23.13	57.23	39.22	63.81	22.83
1997	96.30	99.50	97.01	100.00	22.25	55.88	39.11	66.46	23.82
1998	98.85	99.81	98.45	92.45	21.44	65.97	39.01	64.12	23.81
1999	96.00	100.00	100.00	87.50	20.68	65.97	38.90	68.05	24.26

Table 15 (cont.)

	Crime	Problem gambling	Voter participation	Educational attainment	Number of Indices	AVERAGE SOCIETY GPI INDEX
	Crime Index where minimum (1962=41353 incidents) is benchmark for best	Benchmark year is lowest loss per capita over study period (1973)	Voter Participation Index is where maximum participation in federal, provincial and municipal elections was highest (1967) at an average 60.88%.	Intellectual Capital Index where benchmark is maximum educational attainment 1999=53.8% with some post-secondary or university degree		
1961	85.38	100	87.47	5.58	19	**86.16**
1962	100.00	100	87.47	9.81	19	**86.48**
1963	92.53	100	97.49	14.05	19	**85.53**
1964	87.31	100	93.51	18.29	19	**84.91**
1965	88.45	100	91.46	22.53	19	**83.66**
1966	80.46	100	96.59	26.77	19	**82.94**
1967	73.22	100	100.00	31.00	19	**82.11**
1968	65.02	100	91.25	35.24	19	**79.24**
1969	59.60	100	91.25	39.48	19	**76.41**
1970	53.72	100	91.25	43.72	21	**69.61**
1971	51.54	100	90.35	47.96	21	**69.84**
1972	51.90	100	94.87	50.87	21	**71.34**
1973	50.96	100.00	94.87	53.79	21	**71.61**
1974	45.94	79.37	95.73	56.71	21	**72.26**
1975	43.19	70.71	90.64	59.63	21	**70.02**
1976	43.75	63.77	90.80	62.55	21	**71.00**
1977	45.75	60.94	88.21	65.46	21	**71.57**
1978	45.97	59.74	88.21	68.38	21	**69.69**
1979	44.18	59.19	88.09	71.30	21	**70.18**
1980	41.30	61.06	77.17	74.22	21	**68.73**
1981	40.46	64.40	77.17	77.14	21	**69.71**
1982	40.57	66.51	80.04	78.36	21	**67.64**
1983	41.99	66.11	85.22	79.59	21	**67.35**
1984	42.07	60.14	88.50	80.82	21	**65.33**
1985	41.97	55.97	88.50	82.04	22	**64.15**
1986	42.72	52.92	76.84	83.27	22	**63.37**
1987	40.09	50.42	76.84	84.50	22	**63.42**
1988	37.73	48.08	79.30	85.72	22	**63.11**
1989	39.37	47.00	87.72	86.95	22	**64.21**
1990	37.83	46.89	87.89	88.18	22	**64.57**
1991	33.98	46.80	87.89	89.41	22	**65.48**
1992	36.44	21.73	88.21	90.59	22	**63.58**
1993	40.93	14.45	86.65	91.78	22	**64.25**
1994	46.57	11.00	86.57	92.97	22	**64.93**
1995	48.77	8.99	81.60	94.16	22	**64.32**
1996	49.69	7.73	81.60	95.35	22	**64.09**
1997	49.34	6.91	76.59	96.90	22	**65.48**
1998	50.15	6.24	79.88	98.45	22	**65.89**
1999	53.55	5.76	79.88	100.00	22	**66.39**

Table 15 (cont.)

	Oil and gas reserve life	Oilsands reserve life	Energy use	Agricultural sustainability	Timber sustainability	Forest fragmentation	Parks and wilderness	Fish and wildlife	Wetlands
	Reserve Life Index where 100= maximum reserve life over the period	Reserve Life Index where 100= maximum reserve life 1979 (+40 years) over the period	Alberta Energy Demand Index where 100 = Canada's energy demand in 1961 (the lowest)	Composite agriculture index, includes summerfallow, soil organic carbon, pesticide use, salinity, yield	Timber Sustainability Index for GPI Wheel uses a benchmark of a TSI=1.10 providing 10% addition room for risk, a TSI over 1.10 gets a 100 point score.	Fragmentation Index where 100 represents no fragmentation	Index for protection of natural habitat	Average of caribou (benchmark year =100), bears (target of 2500 bears in province) and sport and commercial fisheries (benchmark year =100)	Wetlands Index where 100 equals the estimated original area covered by wetlands in Alberta (25,000 km^2)
1961	88.19	100.00	97.23	44.70	100.00	96.66		60.08	49.72
1962	88.19	100.00	100.00	46.47	100.00	95.75		59.59	49.44
1963	88.19	100.00	96.91	48.78	100.00	94.85		59.11	49.16
1964	98.84	100.00	93.40	48.71	100.00	93.94		58.63	48.88
1965	99.19	100.00	90.57	49.27	100.00	93.26		58.15	48.60
1966	100.00	100.00	86.43	52.56	100.00	91.52		57.67	48.32
1967	93.62	100.00	81.79	49.98	100.00	90.02		57.19	48.04
1968	89.03	100.00	82.62	51.37	100.00	88.74		56.71	47.76
1969	78.83	100.00	81.78	50.82	100.00	87.36		56.23	47.48
1970	68.03	100.00	79.27	48.13	100.00	86.15		55.75	47.20
1971	62.71	100.00	78.00	51.89	100.00	84.96		55.28	46.92
1972	53.68	100.00	75.40	47.12	100.00	83.67		54.80	46.64
1973	46.98	100.00	71.02	47.59	100.00	82.38		54.33	46.36
1974	46.12	100.00	65.33	45.57	100.00	81.20		53.85	46.08
1975	47.66	100.00	61.72	48.31	100.00	79.96		53.38	45.80
1976	47.94	100.00	62.51	50.29	100.00	78.65		52.90	45.52
1977	46.09	100.00	63.51	48.50	100.00	77.19		52.43	45.24
1978	47.55	100.00	61.75	50.41	100.00	75.87		51.95	44.96
1979	44.59	100.00	58.28	49.43	100.00	74.26		51.48	44.68
1980	45.74	71.00	58.58	48.48	100.00	71.50		67.33	44.40
1981	47.29	78.58	63.42	49.68	86.92	68.54		66.65	44.12
1982	46.21	73.50	61.11	50.18	92.30	65.18		65.97	43.84
1983	47.75	52.29	66.07	49.47	100.00	60.76		65.28	43.56
1984	46.76	69.67	59.37	47.99	100.00	56.84		64.60	43.28
1985	42.65	77.55	54.32	47.99	100.00	52.99		63.92	43.00
1986	45.45	62.99	52.67	51.52	100.00	48.96		61.23	42.72
1987	42.27	59.97	51.49	50.35	100.00	43.45		62.30	42.44
1988	36.78	66.73	48.79	50.78	100.00	39.81		58.33	42.16
1989	36.37	69.98	46.54	51.54	100.00	36.94		55.44	41.88
1990	33.84	60.92	46.90	51.95	100.00	36.24		53.58	41.60
1991	32.99	59.64	48.24	55.00	100.00	34.65		53.98	41.32
1992	29.13	55.48	47.24	54.20	100.00	32.19		51.58	41.04
1993	26.02	51.50	46.71	58.77	100.00	27.99		50.66	40.76
1994	23.80	51.91	45.02	56.96	100.00	24.57		51.08	40.48
1995	22.92	60.68	44.81	59.65	70.34	22.20	0.87	49.88	40.20
1996	21.31	58.15	44.73	61.22	93.46	20.38	10.68	53.30	40.00
1997	20.25	49.14	44.78	60.06	93.34	17.00	11.41	53.50	39.86
1998	19.78	48.90	45.09	61.04	33.18	14.03	21.92	54.04	39.72
1999	19.64	79.15	43.62	61.54	78.90	10.95	33.46	44.77	39.58

Table 15 (cont.)

	Water quality	Air quality	GHG emissions	Carbon budget deficit	Hazardous waste	Landfill waste	Ecological footprint	Number of Indices	AVERAGE ECOLOGICAL GPI INDEX
	Average Water Quality Index	Average Air Quality Index, includes SO_2, CO_2, VOC, NOx and PM	Index where benchmark year =100	Carbon Deficit Index (min = 91.7% GHG emissions as % of sequestration capacity is equal to 100)	Average of hazardous waste data and NPRI data where minimum is benchmark	Percentage of waste to landfill reduction relative to the 50% of 1988 volume reduction target	Rough Index where 4.1 (Canadian average in 1947) is benchmark		
1961		63.67	97.23	100.00			70.89	15	**66.50**
1962		63.67	100.00	100.00			69.75	15	**66.87**
1963		63.67	96.60	100.00			68.83	15	**66.48**
1964		63.67	92.80	100.00			68.17	15	**66.59**
1965		63.67	89.81	100.00			67.02	15	**66.16**
1966		63.67	85.41	100.00			64.88	15	**65.70**
1967		63.67	80.35	100.00			65.23	15	**64.31**
1968		63.67	81.15	100.00			63.68	15	**64.06**
1969		63.67	80.24	100.00			61.16	15	**63.09**
1970		63.67	77.54	100.00			59.12	15	**61.71**
1971		63.67	76.03	100.00			58.52	15	**61.29**
1972		56.98	73.30	100.00			54.55	15	**59.43**
1973		58.96	68.58	100.00			50.62	15	**58.40**
1974	55.02	62.10	62.38	100.00			47.62	16	**57.35**
1975	49.73	63.68	58.44	44.64			49.66	16	**53.32**
1976	49.58	72.22	59.16	43.80			50.91	16	**53.89**
1977	57.26	73.25	60.07	42.66			51.48	16	**54.12**
1978	42.59	71.99	46.72	31.98			50.32	16	**51.58**
1979	48.83	70.93	43.38	28.60			46.43	16	**50.87**
1980	51.39	67.24	43.32	27.21			46.97	16	**49.74**
1981	54.79	71.45	46.31	27.85			48.60	16	**50.32**
1982	47.01	75.39	44.66	26.09			48.65	16	**49.43**
1983	49.13	73.15	47.46	27.62			52.66	16	**48.88**
1984	49.75	71.09	42.55	24.80			51.12	16	**48.51**
1985	43.25	78.50	38.95	22.58			48.36	16	**47.82**
1986	45.65	79.23	37.49	21.46			48.65	16	**46.79**
1987	52.16	77.75	36.70	20.99			48.59	16	**46.19**
1988	53.72	76.50	34.65	19.65			45.53	16	**45.44**
1989	39.86	79.60	33.20	18.55		5.40	45.44	16	**44.31**
1990	48.14	78.76	33.00	17.16		8.00	46.07	16	**43.83**
1991	44.35	82.68	33.39	17.07	88.92	5.89	48.36	16	**49.44**
1992	48.24	80.12	32.94	16.59	95.45	24.82	49.47	16	**48.95**
1993	55.34	81.23	32.09	15.93	97.65	28.10	49.47	16	**48.95**
1994	57.11	81.16	31.27	15.37	64.05	45.40	47.96	16	**46.34**
1995	64.33	82.74	30.37	14.71	45.58	57.47	46.35	17	**41.65**
1996	62.13	84.99	30.05	14.34	66.48	53.65	44.31	17	**44.70**
1997	66.51	85.11	30.36	14.24	47.08	42.64	43.54	17	**43.02**
1998	70.24	80.42	30.90	13.90	54.73	48.35	44.49	17	**40.38**
1999	72.73	80.34	31.30	14.10	42.50	55.04	44.15	17	**44.19**

Table 15 (cont.)

	Economic GPI Composite Index	Societal GPI Composite Index	Environmental GPI Composite	Total GPI	GDP Index	Number of indices
1961	56.96	86.16	66.50	**74.04**	**44.31**	**45**
1962	55.95	86.48	66.87	**74.03**	**45.42**	**45**
1963	54.43	85.53	66.48	**73.11**	**46.65**	**45**
1964	51.71	84.91	66.59	**72.20**	**47.86**	**45**
1965	52.25	83.66	66.16	**71.64**	**49.79**	**45**
1966	52.28	82.94	65.70	**71.14**	**52.84**	**45**
1967	50.51	82.11	64.31	**69.90**	**52.49**	**45**
1968	49.23	79.24	64.06	**68.26**	**52.98**	**45**
1969	47.94	76.41	63.09	**66.37**	**54.48**	**45**
1970	47.57	69.61	61.71	**63.19**	**56.30**	**47**
1971	52.91	69.84	61.29	**64.16**	**56.65**	**48**
1972	53.95	71.34	59.43	**64.41**	**59.89**	**48**
1973	57.27	71.61	58.40	**64.95**	**64.43**	**48**
1974	62.20	72.26	57.35	**65.90**	**68.64**	**49**
1975	61.12	70.02	53.32	**63.40**	**67.92**	**49**
1976	56.03	71.00	53.89	**62.79**	**67.36**	**49**
1977	55.77	71.57	54.12	**63.05**	**68.74**	**49**
1978	57.64	69.69	51.58	**61.85**	**71.01**	**49**
1979	61.39	70.18	50.87	**62.67**	**76.63**	**49**
1980	63.56	68.73	49.74	**62.22**	**76.88**	**49**
1981	66.88	69.71	50.32	**63.68**	**80.10**	**49**
1982	67.05	67.64	49.43	**62.54**	**73.38**	**49**
1983	65.18	67.35	48.88	**61.86**	**69.33**	**49**
1984	66.61	65.33	48.51	**61.19**	**71.83**	**49**
1985	68.38	64.15	47.82	**60.90**	**73.79**	**50**
1986	63.59	63.37	46.79	**59.09**	**74.30**	**50**
1987	61.54	63.42	46.19	**58.43**	**77.00**	**50**
1988	64.29	63.11	45.44	**58.65**	**83.32**	**50**
1989	64.44	64.21	44.31	**58.91**	**82.00**	**50**
1990	63.17	64.57	43.83	**58.68**	**80.79**	**50**
1991	64.26	65.48	49.44	**61.14**	**80.54**	**50**
1992	64.22	63.58	48.95	**60.54**	**80.36**	**50**
1993	65.31	64.25	48.95	**61.16**	**86.58**	**50**
1994	64.46	64.93	46.34	**60.74**	**90.03**	**50**
1995	66.22	64.32	41.65	**59.25**	**92.20**	**51**
1996	65.18	64.09	44.70	**59.80**	**92.74**	**51**
1997	63.68	65.48	43.02	**59.26**	**98.58**	**51**
1998	62.53	65.89	40.38	**58.42**	**98.47**	**51**
1999	63.54	66.39	44.19	**60.26**	**100.00**	**51**

Table 16: Alberta GPI Net Sustainable Income Statement, 1961 to 1999 (1998$)

	Personal Consumption Expenditures	Income Distribution	Weighted Consumption Expenditures B/(C/100) adjusting for income distribution	Non-defensive Government Expenditures (50% of all government expenditures)	Value of Services of Consumer Durables	Value of Public Infrastructure Services	Value of Housework	Value of Parenting and Eldercare	Value of Volunteer Work
	A (+)	B	C	D (-)	E (+)	F (+)	G (+)	H (+)	I (+)
1961	13,027.46	146.08	8,918.02	1,588.55	1,105.84	591.70	6,093	909	609
1962	13,874.27	145.28	9,550.10	1,659.10	1,160.89	615.01	6,860	1,007	685
1963	14,142.37	144.48	9,788.64	1,690.66	1,229.37	629.33	7,450	1,080	743
1964	14,794.69	143.68	10,297.26	1,764.74	1,298.53	640.44	8,097	1,161	807
1965	15,262.86	142.87	10,682.70	1,801.66	1,387.72	658.20	8,443	1,200	841
1966	16,138.33	142.07	11,359.17	1,998.08	1,470.54	685.53	8,666	1,222	863
1967	16,512.11	141.27	11,688.19	2,316.87	1,576.57	710.10	8,866	1,242	882
1968	17,283.70	140.47	12,304.16	2,418.09	1,647.61	728.83	9,002	1,254	895
1969	18,426.55	139.67	13,193.02	2,532.38	1,757.75	747.47	9,166	1,270	911
1970	18,967.24	138.87	13,658.50	2,829.47	1,771.71	767.27	9,355	1,291	930
1971	18,536.81	129.01	14,368.65	3,502.95	1,896.44	784.86	9,295	1,278	923
1972	19,984.29	130.11	15,359.72	3,619.30	2,046.49	803.02	11,628	1,625	1,101
1973	20,223.69	125.44	16,122.40	3,708.52	2,252.19	825.99	12,721	1,795	1,169
1974	18,650.67	128.83	14,477.19	3,375.22	2,561.26	858.30	11,662	1,656	1,050
1975	19,018.78	126.94	14,982.45	3,654.96	2,698.41	899.89	11,857	1,692	1,052
1976	19,666.67	124.10	15,846.97	3,924.92	2,930.69	937.01	12,132	1,737	1,064
1977	20,582.42	122.63	16,783.81	4,064.54	3,149.44	984.06	12,682	1,821	1,102
1978	21,443.84	128.95	16,629.72	4,157.10	3,376.43	1031.18	12,931	1,860	1,116
1979	22,760.29	124.35	18,302.91	4,493.08	3,672.46	1075.70	12,792	1,844	1,097
1980	23,432.57	114.34	20,493.41	4,340.32	3,906.05	1125.72	12,126	1,750	1,035
1981	25,178.69	110.77	22,731.42	4,963.56	3,999.02	1226.41	11,990	1,733	1,019
1982	24,251.04	112.69	21,519.57	5,193.29	3,800.69	1338.60	11,425	1,516	936
1983	24,302.22	121.79	19,953.45	5,417.81	3,728.40	1402.54	11,321	1,385	896
1984	25,416.39	115.03	22,094.54	5,871.57	3,769.25	1444.95	11,733	1,326	901
1985	26,857.36	110.70	24,260.98	6,017.21	3,931.13	1500.38	11,962	1,253	892
1986	32,328.05	114.84	28,149.47	6,994.58	4,289.98	1550.39	14,171	1,378	1,030
1987	34,381.80	113.94	30,175.59	7,148.23	4,421.35	1591.58	15,432	1,505	1,127
1988	38,026.92	113.73	33,435.29	7,719.09	4,724.51	1628.75	16,998	1,661	1,247
1989	39,392.08	100.00	39,392.08	8,055.34	4,904.91	1656.51	17,458	1,710	1,286
1990	38,858.49	100.00	38,858.49	8,012.59	4,825.41	1694.47	17,289	1,696	1,278
1991	40,822.25	106.62	38,287.54	8,322.42	4,651.78	1711.10	18,468	1,814	1,369
1992	41,137.38	110.80	37,127.13	8,429.58	4,620.04	1718.10	19,536	1,922	1,452
1993	42,836.71	108.36	39,530.98	8,202.66	4,670.97	1715.33	21,230	2,124	1,557
1994	43,741.30	100.00	43,741.30	7,692.61	4,751.82	1715.81	22,249	2,257	1,613
1995	44,502.46	101.05	44,042.09	7,611.32	4,759.47	1704.20	23,400	2,403	1,680
1996	45,162.99	106.27	42,497.64	7,282.92	4,781.79	1686.96	23,835	2,473	1,695
1997	48,880.44	106.97	45,696.05	7,334.63	4,934.81	1664.78	24,966	2,615	1,761
1998	52,802.00	108.01	48,884.43	7,943.00	5,261.57	1655.77	27,255	2,878	1,909
1999	52,838.59	110.18	47,957.49	7,727.89	5,532.50	1660.96	32,907	3,292	2,631

Table 16 (cont.)

	Value of Free Time	Net Capital Investment	Cost of Household and Personal Debt Servicing	Cost of Consumer Durables	Cost of Unemployment and Underemployment	Cost of Auto Crashes	Cost of Commuting	Cost of Crime	Cost of Family Breakdown
	J (+)	K (+)	L (-)	M (-)	N (-)	O (-)	P (-)	Q (-)	R (-)
1961			590.05	1,679.05	232	3,809.46	608	931.34	20.91
1962	0.003		652.01	1,854.74	241	4,409.32	651	894.41	21.87
1963	0.006		726.69	1,945.94	249	5,021.69	694	967.86	25.51
1964	0.008		821.63	2,079.87	264	5,614.06	753	1,028.16	27.95
1965	0.011		912.33	2,197.04	289	6,136.90	835	1,056.93	27.12
1966	0.013	(333.11)	958.54	2,421.62	313	6,284.07	909	1,157.76	31.53
1967	0.016	(251.65)	992.46	2,516.56	366	6,623.17	981	1,334.34	34.93
1968	0.019	(204.80)	1,214.21	2,656.05	471	6,691.32	1,047	1,354.07	38.55
1969	0.024	(149.45)	1,425.52	2,825.25	536	7,121.41	1,153	1,392.62	69.34
1970	0.027	(100.64)	1,513.98	2,549.09	868	6,539.16	1,191	1,499.86	75.88
1971	0.035	(100.31)	1,406.77	2,506.23	1,025	6,708.82	1,318	1,584.67	73.49
1972	0.038	(156.09)	1,507.63	3,047.20	1,111	6,954.08	1,442	1,552.98	75.90
1973	0.039	(153.90)	1,905.19	3,412.59	1,126	7,078.62	1,605	1,551.87	89.24
1974	0.035	(128.90)	2,644.21	3,808.43	825	6,781.80	1,759	1,412.87	99.54
1975	0.036	(114.24)	2,633.64	4,058.91	1,102	6,021.98	1,842	1,395.83	110.17
1976	0.038	(232.73)	3,091.45	4,440.38	1,167	5,627.87	2,059	1,365.11	114.63
1977	0.041	(213.05)	2,954.26	4,488.00	1,437	4,050.23	2,232	1,358.23	117.57
1978	0.041	(232.75)	3,542.93	4,563.47	1,579	6,091.89	2,425	1,348.02	121.92
1979	0.042	(294.51)	4,867.50	5,110.56	1,395	6,394.78	2,656	1,365.88	131.42
1980	0.041	(359.49)	5,425.24	5,447.91	1,485	6,615.57	2,897	1,376.55	152.52
1981	0.046	(170.57)	6,263.79	5,653.44	1,813	6,132.71	3,363	1,439.79	169.39
1982	0.045	67.63	5,571.50	4,641.39	3,730	4,861.32	3,318	1,434.88	178.72
1983	0.041	260.73	3,906.46	4,425.22	5,067	4,045.22	3,257	1,390.31	176.23
1984	0.040	419.07	4,151.07	4,896.00	5,203	3,805.09	3,288	1,395.70	170.11
1985	0.039	631.60	4,010.31	5,451.41	4,825	3,881.65	3,453	1,386.45	163.03
1986	0.044	683.20	4,772.69	5,554.40	4,634	4,032.93	3,445	1,512.49	192.28
1987	0.043	578.09	4,933.32	5,388.05	4,446	3,542.43	3,322	1,571.37	131.50
1988	0.046	481.68	5,670.28	5,815.68	3,845	3,384.20	3,463	1,661.90	175.95
1989	0.046	406.35	7,033.18	6,166.57	3,531	3,449.68	3,526	1,672.83	165.74
1990	0.045	305.30	7,737.42	6,083.31	3,548	3,118.02	3,609	1,694.56	170.69
1991	0.047	160.15	6,027.16	5,801.95	4,185	2,934.33	3,789	1,835.43	168.78
1992	0.049	(1.52)	5,362.74	5,538.19	4,935	2,678.60	3,839	1,822.73	165.34
1993	0.051	(113.27)	5,037.76	5,726.83	5,270	2,688.90	3,836	1,800.14	173.29
1994	0.051	(217.00)	5,528.70	5,963.80	4,752	2,738.39	3,816	1,744.27	164.48
1995	0.050	(368.64)	6,203.84	6,193.31	4,317	2,769.89	3,753	1,717.90	152.91
1996	0.049	(450.20)	4,926.65	6,655.19	3,966	2,886.02	3,755	1,680.15	151.10
1997	0.053	(583.75)	4,866.04	7,761.93	3,626	2,984.40	4,061	1,669.28	144.58
1998	0.059	(719.44)	5,459.30	7,955.00	3,665	3,079.28	4,170	1,892.14	147.96
1999	0.057	(864.64)	6,433.77	7,998.17	3,824	3,026.43	4,406	1,833.23	147.96

Table 16 (cont.)

	Cost of Suicide	Cost of Gambling	Cost of Nonrenewable Resource Use	Cost of non-timber forest values due to change in productive forest	Cost of Unsustainable Timber Resource Use (loss in pulp production value)	Cost of erosion on bare soil on cultivated land (on-site and off-site)	Cost of reduction in yields due to salinity on dryland and irrigated cropland	Cost of air pollution	Cost of GHG (damage of climate change)
	S (-)	T (-)	U (-)	V (-)	W (-)	X (-)	Z (-)	AA (-)	AB (-)
1961	0.68	56.18	1,161.18	-	-	28.86	16.41	593.13	659.03
1962	0.66	57.77	1,129.28	0.39	0.24	28.08	19.10	610.01	677.79
1963	0.61	59.21	1,308.42	0.78	0.48	27.32	21.29	625.12	694.58
1964	0.89	60.22	1,445.75	1.11	0.68	26.59	19.65	635.78	706.42
1965	0.91	61.06	1,251.85	1.47	0.90	26.65	20.68	644.67	716.30
1966	0.83	61.65	1,388.25	2.49	1.53	25.80	25.01	650.89	723.21
1967	0.78	62.82	1,510.17	3.38	2.08	25.76	19.65	663.33	737.03
1968	0.88	64.25	1,595.69	4.11	2.52	27.12	23.37	678.43	753.81
1969	1.12	65.73	1,784.36	4.77	2.93	28.67	24.40	693.98	771.09
1970	1.21	67.20	2,090.52	5.30	3.25	34.48	27.90	709.53	788.37
1971	1.04	70.09	2,378.95	5.82	3.57	27.15	26.17	740.06	822.29
1972	1.22	71.29	2,649.88	6.31	3.87	29.44	29.36	752.67	836.30
1973	1.23	72.60	3,596.68	6.81	4.18	26.34	25.91	766.55	851.72
1974	1.59	93.02	5,624.21	7.28	4.47	28.28	24.51	779.56	866.18
1975	1.51	107.64	6,203.15	7.75	4.75	26.73	28.03	803.58	892.87
1976	1.76	123.35	6,715.09	8.26	5.07	25.18	30.16	830.51	922.79
1977	1.96	134.50	7,227.55	8.84	5.43	27.12	30.49	865.33	961.48
1978	1.88	142.41	7,959.30	9.24	5.67	24.41	29.96	1,011.71	1,124.12
1979	1.79	149.12	8,934.32	9.60	5.89	25.18	30.49	1,191.46	1,323.85
1980	2.21	151.09	10,858.93	10.78	6.61	23.63	49.68	1,227.93	1,364.37
1981	1.96	149.89	10,687.14	12.07	7.41	21.31	48.61	1,269.72	1,410.80
1982	2.04	149.84	10,700.85	13.46	8.26	20.34	48.51	1,298.22	1,442.47
1983	2.24	152.15	14,476.09	15.37	9.43	19.76	44.98	1,334.91	1,483.23
1984	2.31	167.23	14,303.61	15.08	9.25	19.37	40.18	1,412.76	1,569.73
1985	1.69	180.66	15,797.75	15.75	9.67	19.37	40.86	1,488.47	1,653.85
1986	2.41	193.28	7,689.89	15.42	9.46	20.34	58.31	1,500.90	1,667.66
1987	2.19	203.24	7,924.77	15.56	9.55	20.53	52.92	1,522.28	1,691.42
1988	2.28	214.83	5,632.48	15.93	9.78	20.73	56.05	1,625.54	1,806.16
1989	2.06	223.43	5,616.07	17.25	10.58	19.18	50.08	1,688.42	1,876.02
1990	2.29	228.62	7,677.06	16.65	10.22	20.14	57.94	2,988.00	3,320.00
1991	2.63	233.08	4,538.50	16.15	9.91	16.96	55.57	3,006.00	3,340.00
1992	2.69	510.23	5,696.17	16.42	10.08	15.50	52.79	3,096.00	3,440.00
1993	2.43	777.57	7,183.98	17.62	10.81	15.50	66.28	3,222.00	3,580.00
1994	2.49	1,034.63	7,398.31	18.33	11.25	14.33	56.81	3,348.00	3,720.00
1995	2.59	1,282.44	6,224.43	18.92	11.61	14.72	63.70	3,492.00	3,880.00
1996	2.69	1,513.04	9,753.62	19.35	11.87	12.40	63.09	3,582.00	3,980.00
1997	2.33	1,728.53	10,241.17	21.02	12.90	13.56	59.17	3,618.00	4,020.00
1998	2.38	1,959.25	7,162.26	22.16	13.60	12.78	58.15	3,642.00	4,046.67
1999	2.43	2,167.50	10,656.30	23.78	14.60	12.78	58.15	3,666.00	4,073.33

Table 16 (cont.)

	Cost of Loss of Wetlands	Environmental Cost of Human Wastewater Pollution	Non-market Cost of Toxic Waste Liabilities	Non-market Cost of Municipal waste Landfills 1988-1999	**GPI (total), with debt costs**	**GPI (total) without debt**	**GDP (total)**
	AC (-)	AD (-)	AE (-)	AF (-)	AG	AH	AI
1961	6,392.77	0.26	0.48	104.80	2,930.5	3,520.6	21,887.5
1962	6,428.37	0.27	0.50	107.78	3,753.4	4,405.4	23,075.3
1963	6,463.97	0.27	0.53	110.45	3,668.1	4,394.8	24,286.3
1964	6,499.57	0.28	0.55	112.33	3,966.8	4,788.4	25,345.2
1965	6,535.17	0.28	0.58	113.90	4,185.3	5,097.6	26,735.6
1966	6,570.77	0.28	0.62	115.00	4,288.2	5,246.8	28,644.8
1967	6,606.37	0.29	0.63	117.20	4,431.8	5,424.3	29,000.0
1968	6,641.98	0.30	0.65	119.87	4,659.9	5,874.1	29,935.3
1969	6,677.58	0.30	0.68	122.62	4,727.2	6,152.7	31,491.9
1970	6,713.18	0.31	0.72	125.36	5,696.9	7,210.9	33,273.1
1971	6,748.78	0.32	0.76	130.76	6,369.5	7,776.3	34,920.3
1972	6,784.38	0.33	0.82	132.99	9,037.0	10,544.6	37,546.1
1973	6,819.98	0.33	0.89	135.44	9,364.0	11,269.2	41,132.8
1974	6,855.58	0.34	0.97	137.74	3,756.3	6,400.5	44,565.1
1975	6,891.18	0.35	0.99	141.98	4,447.3	7,080.9	45,460.6
1976	6,926.78	0.36	1.01	146.74	4,736.1	7,827.6	46,592.1
1977	6,962.38	0.38	1.08	152.89	7,357.2	10,311.4	49,540.6
1978	6,997.98	0.39	1.15	158.71	3,729.8	7,272.7	53,124.4
1979	7,033.58	0.41	1.29	164.66	2,189.9	7,057.4	59,483.6
1980	7,069.18	0.42	1.35	172.11	78.8	5,504.1	62,373.1
1981	7,104.78	0.44	1.48	180.09	1,760.0	8,023.7	68,004.3
1982	7,140.38	0.46	1.40	185.91	1,048.7	6,620.2	64,311.2
1983	7,175.98	0.46	1.33	187.65	(2,804.8)	1,101.6	61,328.0
1984	7,211.58	0.46	1.38	187.62	(289.4)	3,861.6	63,534.0
1985	7,247.18	0.46	1.42	188.63	631.8	4,642.1	65,617.1
1986	7,282.78	0.47	1.45	190.82	15,469.1	20,241.8	66,836.8
1987	7,318.38	0.47	1.51	191.18	19,690.2	24,623.5	69,390.5
1988	7,353.98	0.47	1.64	221.77	26,917.8	32,588.1	75,683.6
1989	7,389.58	0.48	1.64	218.67	32,209.7	39,242.9	75,735.3
1990	7,425.18	0.49	1.65	220.50	26,029.6	33,767.0	76,163.2
1991	7,460.78	0.50	1.68	226.62	31,134.2	37,161.4	77,263.8
1992	7,496.38	0.51	1.31	207.20	29,916.5	35,279.3	78,338.5
1993	7,531.98	0.52	1.34	207.93	31,766.5	36,804.2	85,563.8
1994	7,567.58	0.52	2.13	187.05	35,733.6	41,262.3	90,116.3
1995	7,603.18	0.53	6.00	173.42	37,349.0	43,552.8	93,478.5
1996	7,628.61	0.54	2.14	179.47	33,033.3	37,960.0	95,429.8
1997	7,646.41	0.55	3.86	197.29	35,710.7	40,576.8	103,495.0
1998	7,664.21	0.56	2.89	192.63	43,918.6	49,377.9	105,927.0
1999	7,682.01	0.57	4.71	190.10	44,622.6	51,056.3	109,708.4

Endnotes

[1] Former Senator Robert Kennedy, in 1968, summed up the shortcomings of the GNP/GDP in a speech at the University of Kansas: "Too much and too long, we seem to have surrendered community excellence and community values in the mere accumulation of material things. Our gross national product ... if we should judge America by that – counts air pollution and cigarette advertising, and ambulances to clear our highways of carnage. It counts special locks for our doors and the jails for those who break them. It counts the destruction of our redwoods and the loss of our natural wonder in chaotic sprawl. It counts napalm and the cost of a nuclear warhead, and armored cars for police who fight riots in our streets. It counts Whitman's rifle and Speck's knife, and the television programs which glorify violence in order to sell toys to our children.

"Yet the gross national product does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages; the intelligence of our public debate or the integrity of our public officials. It measures neither our wit nor our courage; neither our wisdom nor our learning; neither our compassion nor our devotion to our country; it measures everything, in short, except that which makes life worthwhile. And it tells us everything about America except why we are proud that we are Americans." Source: www.rfkmemorial.org/RFK/rfk_quotes.htm (accessed August 27, 2001)

[2] In *The New Republic*, October 20, 1962

[3] Küznets wrote in 1965: "It does seem to me, however, that as customary national income estimates and analysis are extended, and as their coverage includes more and more countries that differ markedly in their industrial structure and form of social organization, investigators interested in quantitative comparisons will have to take greater cognizance of the aspects of economic and social life that do not now enter national income measurement; and that national income concepts will have to be either modified or partly abandoned, in favour of more inclusive measures, less dependent on the appraisals of the market system… The eventual solution would obviously lie in devising a single yardstick that could then be applied to both types of economies – a yardstick that would perhaps lie outside the different economic and social institutions and be grounded in experimental science (of nutrition, warmth, health, shelter, etc.)[3]

[4] Review of John Kenneth Galbraith's address to the Frank M. Engle Lecture in Economic Security at the American College in Bryn Mawr, Pennsylvania in May 1999 appeared in the August 2, 1999 issue of the *IMF Survey*.

[5] From a speech (May 25, 2001) by the Honourable Paul Martin, Minister of Finance at a breakfast organized by the National Round Table on the Environment and the Economy (Ottawa).

[6] "Chrematistics" is a word found only in unabridged dictionaries. It refers to "the science of wealth: a branch of political economy relating to the manipulation of prosperity and wealth." *Webster's New Twentieth Century Dictionary, Unabridged 2nd Edition*, 1979.

7 The GPI is an expansion of the original Index of Sustainable Economic Welfare (ISEW) conceived and developed by John B. Cobb, Jr., Clifford Cobb and Herman Daly (see *For the Common Good* by Daly and Cobb 1989, 1994). The GPI embodies these earlier pioneering efforts. The GPI has been replicated in Australia (Hamilton 2000 and Hamilton and Saddler 1997) and Canada (Messinger and Tarsofsky 1997 and Colman 1998, in the case of GPI Atlantic). The ISEW has been developed for United Kingdom (Jackson and Marks 1994), Germany (Hochreiter *et al*. 1995), Austria (Stockhammer *et. al*. 1997), Sweden (Jackson and Stymne 1996), Italy (Guenno and Tiezzi 1996), Australia (Hamilton 1997), and Chile (Castenada 1997).

[8] Henderson, Hazel, J. Likerman, and P. Flynn. 2000.

[9] Wackernagel, M., *et al*. 1997.

[10] Indeed, public accountancy has historically treated investments in public infrastructure as literally "valueless" since most capital was written-off at a nominal $1 in the public accounts. For example, the construction of a hospital or a bridge would not show up on the balance sheet of a city or province but be expensed as an annual operating cost. This goes both against common sense and against conventional capital cost accounting used in general accepting accounting for business. More recently some governments, including the Alberta Government have begun to estimate the book value of public assets (infrastructure) and assign a depreciation cost value.

[11] Mendelsohn, Matthew. 2000.

[12] In personal e-mail communication with Professor Joseph H. Michalski, Ph.D. (Assistant Professor, Department of Sociology, Trent University), August 30, 2001, who helped analyze the findings from

the public dialogue sessions, the participants in the Ottawa group continued to associate terms such as "sustainable," "predictable," "generating employment," and "diversified" with the concept of a "healthy economy." These sentiments were echoed in a Carberry discussion, where participants used the language of a "healthy and sustainable economy" as well. In addition, nearly one in four groups recognized the importance of providing support for small business as important to quality of life. Participants who discussed the issue generally viewed a healthy business community as vital to providing jobs, security, and contributing to the overall community in a variety of different ways.

[13] Most of the current GPI or ISEW analyses replicated internationally have adopted the original U.S. GPI or ISEW methodology without significant change to the accounting architecture. The Alberta GPI project and the Atlantic GPI project for Nova Scotia are the first to consider changes and improvements to the original GPI/ISEW work.

[14] The U.S. GPI assumed only the value of streets and highways as public infrastructure that contributes to the welfare of society (see Anielski and Rowe 2000).

[15] GPI Atlantic. 1998. *Measuring Sustainable Development: Application of the Genuine Progress Index to Nova Scotia*, Progress Report and Future Directions.

[16] Ecological Footprint analysis uses largely personal consumption spending data upon which to estimate relative resource consumption to meet current lifestyles. There are critics of the EF analysis including Jeroen C.J. M. van den Bergh and Harmen Verbruggen (1999) who argue that EFs are confusing, non-transparent, arbitrary, incomplete, normative and aggregate. EF analysis while intuitively attractive has considerable room for improvement. For example, the analysis might benefit from physical material and energy flow analysis that tracks actual resource flows in an economy (an input-output analytical system).

[17] Personal email communication with Dr. John Cobb Jr. September 18, 2000.

[18] Personal communication with Dr. Clive Hamilton, The Australia Institute, January 15, 2001.

[19] The GPI was developed by Cobb, Halstead and Rowe for Redefining Progress (San Francisco) in 1995, and updated for 1997 by Anielski and Rowe (1999) and again for 1998 Cobb and Wackernagel for 1998.

[20] Hamilton, Clive. 2000.

[21] Neumayer, Eric. 1998.

[22] Edmonton Social Planning Council. 2000.